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For related information see also *Astronautics*.

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VOLUME 23 NUMBER 22 / NOVEMBER 23, 1985

TABLE OF CONTENTS

AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

01 AERONAUTICS (GENERAL) 3727

02 AERODYNAMICS 3727

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY 3728

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION 3729

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications.*

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 3729

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

06 AIRCRAFT INSTRUMENTATION 3730

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

07 AIRCRAFT PROPULSION AND POWER N.A.

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

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For related information see also *14 Ground Support Systems and Facilities (Space).*

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Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) 3731

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) 3737

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research and Support Facilities (Air).*

15 LAUNCH VEHICLES AND SPACE VEHICLES 3738

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

16 SPACE TRANSPORTATION 3738

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING 3739

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3740

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

19 SPACECRAFT INSTRUMENTATION 3741

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

20 SPACECRAFT PROPULSION AND POWER 3741

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

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23 CHEMISTRY AND MATERIALS (GENERAL) 3741
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 3742
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 3743
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS 3748
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 3751
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS 3753
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

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For related information see also *Physics.*

31 ENGINEERING (GENERAL) 3754
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 3755
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING 3758
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER 3782
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY 3786
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS 3790
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 3791
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY 3795
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS 3795
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

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For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES 3801
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION 3804
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION 3810
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS 3813
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY 3816
Includes weather forecasting and modification.

48 OCEANOGRAPHY 3818
Includes biological, dynamic and physical oceanography; and marine resources.

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51 LIFE SCIENCES (GENERAL) **3818**
Includes genetics.

52 AEROSPACE MEDICINE **3820**
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Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

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59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **N.A.**

60 COMPUTER OPERATIONS AND HARDWARE **3827**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **3828**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS **3833**
Includes computer networks.

63 CYBERNETICS **3834**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **3834**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **3834**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **3835**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **3835**
Includes topology and number theory.

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For related information see also *Engineering.*

70 PHYSICS (GENERAL) **3836**
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS **3836**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **3836**
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **3838**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **3844**
Includes light phenomena.

75 PLASMA PHYSICS **3845**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **3847**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **3848**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

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80 SOCIAL SCIENCES (GENERAL) **N.A.**
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Includes management planning and research.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3849
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3849
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY N.A.
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3850
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3851
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3859
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3860
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

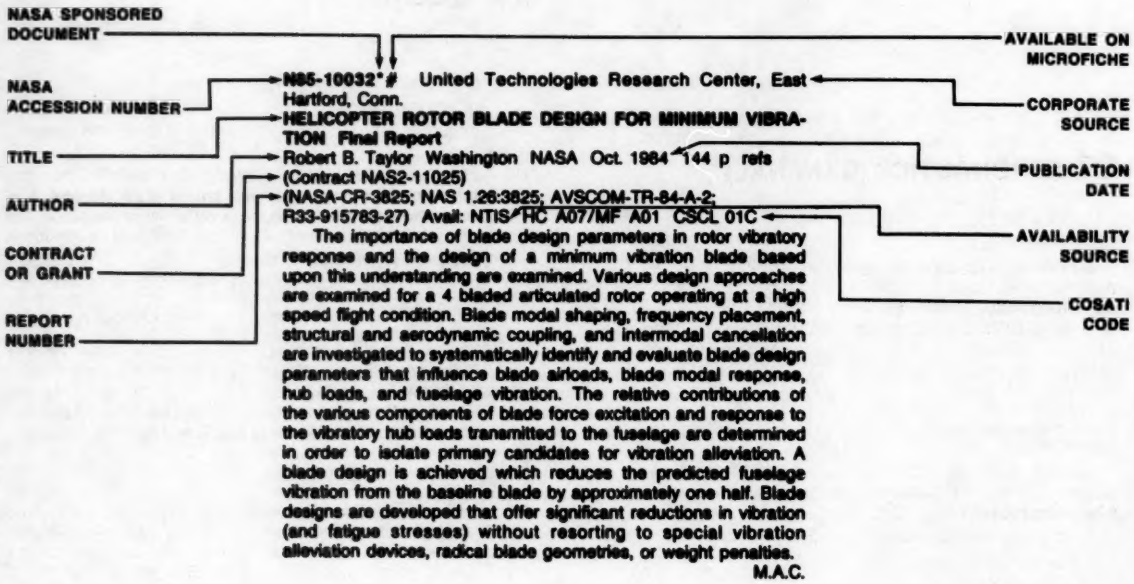
GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

SUBJECT INDEX I-1
PERSONAL AUTHOR INDEX I-61
CORPORATE SOURCE INDEX I-71
CONTRACT NUMBER INDEX I-85
REPORT / ACCESSION NUMBER INDEX I-87

TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
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NASA ACCESSION NUMBER
N85-10032*# United Technologies Research Center, East Hartford, Conn.
CORPORATE SOURCE
TITLE
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
PUBLICATION DATE
AUTHOR
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
CONTRACT OR GRANT
(Contract NAS2-11025)
REPORT NUMBER
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
AVAILABILITY SOURCE
COSATI CODE
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 22 / NOVEMBER 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-33104* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 189)
Jul. 1985 157 p
(NASA-SP-7037(189); NAS 1.21:7037(189)) Avail: NTIS HC $6.00 (special price) CSCL 01A

This bibliography lists 579 reports, articles and other documents introduced into the NASA scientific and technical information system in June 1985. NASA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-33105*# Scientific Research Associates, Inc., Glastonbury, Conn.
CALCULATION OF STEADY AND UNSTEADY AIRFOIL FLOW FIELDS VIA THE NAVIER-STOKES EQUATIONS Final Report
Stephen J. Shamroth Washington NASA Aug. 1985 110 p refs
(Contract NAS1-15214)
(NASA-CR-3899; NAS 1.26:3899) Avail: NTIS HC A06/MF A01 CSCL 01A

A compressible time-dependent procedure for the two-dimensional ensemble averaged Navier-Stokes equations has been applied to the isolated airfoil problem in steady and unsteady flows. The procedure solves the governing equations via the linearized block implicit technique. Turbulence is modeled either via a mixing length or turbulence energy approach. The equations are solved in general non-orthogonal form with no-slip boundary conditions applied at the airfoil surface. Results are presented for airfoils at constant incidence, an airfoil in ramp motion and an airfoil oscillating through a dynamic stall loop. In general, steady converged solutions are obtained within 70 time steps over the range of Mach numbers considered. Comparisons with measured data show good agreement between computation and measurement. B.W.

N85-33106*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AN IMAGE COMPRESSION SURVEY AND ALGORITHM SWITCHING BASED ON SCENE ACTIVITY
Michael M. Hart Aug. 1985 20 p refs
(NASA-TP-2458; L-15957; NAS 1.60:2458) Avail: NTIS HC A02/MF A01 CSCL 01A

Data compression techniques are presented. A description of these techniques is provided along with a performance evaluation. The complexity of the hardware resulting from their implementation is also addressed. The compression effect on channel distortion and the applicability of these algorithms to real-time processing are presented. Also included is a proposed new direction for an adaptive compression technique for real-time processing. Author

N85-33107*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AERODYNAMIC CHARACTERISTICS OF A DISTINCT WING-BODY CONFIGURATION AT MACH 6: EXPERIMENT, THEORY, AND THE HYPERSONIC ISOLATION PRINCIPLE
Jim A. Penland and James L. Pittman Aug. 1985 34 p refs
(NASA-TP-2467; L-15951; NAS 1.60:2467) Avail: NTIS HC A03/MF A01 CSCL 01A

An experimental investigation has been conducted to determine the effect of wing leading edge sweep and wing translation on the aerodynamic characteristics of a wing body configuration at a free stream Mach number of about 6 and Reynolds number (based on body length) of 17.9 x 10 to the 6th power. Seven wings with leading edge sweep angles from -20 deg to 60 deg were tested on a common body over an angle of attack range from -12 deg to 10 deg. All wings had a common span, aspect ratio, taper ratio, planform area, and thickness ratio. Wings were translated longitudinally on the body to make tests possible with the total and exposed mean aerodynamic chords located at a fixed body station. Aerodynamic forces were found to be independent of wing sweep and translation, and pitching moments were constant when the exposed wing mean aerodynamic chord was located at a fixed body station. Thus, the Hypersonic Isolation Principle was verified. Theory applied with tangent wedge pressures on the wing and tangent cone pressures on the body provided excellent predictions of aerodynamic force coefficients but poor estimates of moment coefficients. Author

N85-33108*# National Aeronautics and Space Administration, Washington, D. C.
DISCUSSION OF THE PAPER, SOME ASPECTS OF PROPULSION FOR THE AUGMENTER-WING CONCEPT, BY D. C. WHITTLEY
H. Schmitt Jul. 1985 11 p Transl. into ENGLISH of conf. paper from AGARD p A9 Previously announced as N72-16698
(NASA-TM-77884; NAS 1.15:77884) Avail: NTIS HC A02/MF A01 CSCL 01A

Many modern concepts for STOL and V/STOL aircraft rely on integration of the propulsion system with the wing to create favorable lift interactions, and are known as powered lift concepts. A study of powered lift, concerning management and control of the various propulsive streams or jets is presented, each concept having its own particular objectives and requirements. Some specific objectives of this kind are described which relate to the augmenter wing. Consideration is given to three aspects of the subject, namely the augmenter flap itself, the wind ducting and augmenter primary nozzle, and the choice of powerplant or engine

cycle. More generally, comments are made regarding noise attenuation and the prospect for achieving a low overall noise level for jet STOL aircraft of the future. Author

N85-33109*# Scientific Research Associates, Inc., Glastonbury, Conn.
ON THE APPLICATION OF A HAIRPIN VORTEX MODEL OF WALL TURBULENCE TO TRAILING EDGE NOISE PREDICTION Final Report
N. S. Liu and S. J. Shamroth Aug. 1985 57 p refs
(Contract NAS1-17249)
(NASA-CR-177938; NAS 1.26:177938; R85-900026-F) Avail: NTIS HC A04/MF A01 CSCL 01A

The goal is to develop a technique via a hairpin vortex model of the turbulent boundary layer, which would lead to the estimation of the aerodynamic input for use in trailing edge noise prediction theories. The work described represents an initial step in reaching this goal. The hairpin vortex is considered as the underlying structure of the wall turbulence and the turbulent boundary layer is viewed as an ensemble of typical hairpin vortices of different sizes. A synthesis technique is examined which links the mean flow and various turbulence quantities via these typical vortices. The distribution of turbulence quantities among vortices of different scales follows directly from the probability distribution needed to give the measured mean flow vorticity. The main features of individual representative hairpin vortices are discussed in detail and a preliminary assessment of the synthesis approach is made. R.J.F.

N85-33110*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL INVESTIGATIONS ON AIRFOILS WITH DIFFERENT GEOMETRIES IN THE DOMAIN OF HIGH ANGLES OF ATTACK-FLOW SEPARATION
J. Keil Jul. 1985 83 p refs Transl. into ENGLISH of "Experimentelle Untersuchungen an Fluegeln verschiedener Geometrie im hohen Anstellwinkelbereich" Darmstadt, Inst. fuer Flugtechnik, 16 Mar. 1984 p 1-89 Original language document announced as N84-33393 Transl. by The Corporate Word, Inc., Pittsburgh, (Contract NAS2-4006)
(NASA-TM-77892; NAS 1.15:77892) Avail: NTIS HC A05/MF A01 CSCL 01A

Wind tunnel tests were conducted on airfoil models in order to study the flow separation phenomena occurring for high angles of attack. Pressure distribution on wings of different geometries were measured. Results show that for three-dimensional airfoils layout and span lift play a role. Separation effects on airfoils with moderate extension are three-dimensional. The flow domains separated from the air foil must be treated three-dimensionally. The rolling-up of separated vortex layers increases with angle in intensity and induction effect and shows strong nonlinearities. Boundary layer material moves perpendicularly to the flow direction due to the pressure gradients at the airfoil; this has a stabilizing effect. The separation starts earlier with increasing pointed profiles. Author (ESA)

N85-33111*# Integrated Systems, Inc., Palo Alto, Calif.
FIXED GAIN AND ADAPTIVE TECHNIQUES FOR ROTORCRAFT VIBRATION CONTROL
R. H. Roy, H. A. Saberi, and R. A. Walker May 1985 127 p refs
(Contract NAS2-11548)
(NASA-CR-177344; NAS 1.26:177344; T47130) Avail: NTIS HC A07/MF A01 CSCL 01A

The results of an analysis effort performed to demonstrate the feasibility of employing approximate dynamical models and frequency shaped cost functional control law desgin techniques for helicopter vibration suppression are presented. Both fixed gain and adaptive control designs based on linear second order dynamical models were implemented in a detailed Rotor Systems Research Aircraft (RSRA) simulation to validate these active vibration suppression control laws. Approximate models of fuselage flexibility were included in the RSRA simulation in order to more accurately characterize the structural dynamics. The results for both the fixed gain and adaptive approaches are promising and provide a foundation for pursuing further validation in more extensive simulation studies and in wind tunnel and/or flight tests. Author

N85-33112# Aeronautical Research Labs., Melbourne (Australia).
GENERATION BY CONFORMAL MAPPINGS OF AEROFOIL SECTIONS AND OF CERTAIN OTHER SIMPLE SHAPES SUITABLE FOR BOTH AERODYNAMIC AND STRESS-CONCENTRATION PROBLEMS
T. Tran-Cong Nov. 1984 36 p
(AD-A154901; ARL/AERO-TM-369) Avail: NTIS HC A03/MF A01

This Australian report shows that there are many practical aerofoil shapes obtainable from conformal mapping using simple techniques. Employing the results given here, it is a matter of straightforward application to calculate the pure circulation, inviscid, incompressible flow about the aerofoils of this Memo. The pressure distribution then follows directly. Two-dimensional problems of incompressible Stokes' flow about these cross sections and of stress concentration for an infinite elastic plate with a hole of these shapes can also be solved using the conformal mappings given here. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-33113# Mitre Corp., McLean, Va. Metrek Div.
SYSTEM SAFETY STUDY OF MINIMUM TCAS 2 FOR INSTRUMENT WEATHER CONDITIONS Final Report
John E. Lebron and Steven J. Mulder Jun. 1985 201 p refs
(Contract DTFA01-84-C-00001)
(FAA/PM-85-12; MTR-85W28) Avail: NTIS HC A10/MF A01

An analysis of the air traffic environment in instrument meteorological conditions (IMC) was conducted to identify those characteristics that have an impact on the level of safety provided by the traffic alert and collision avoidance system (Minimum TCAS 2), and that differ from those characteristics under the more predominant visual conditions. The characteristics assessed include the fraction of aircraft equipped with altitude reporting transponders, the proximity of aircraft operating in these conditions, and the nature of the aircraft maneuvers. The analysis of the level of safety provided by TCAS was extended to include interactions with the air traffic control system. Interactions asessed include the compatibility of TCAS maneuvers with the ATC system and the potential for a domino effect wherein a TCAS advisory might create a new conflict. Author

N85-33114# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT: WORLD AIRWAYS INC., FLIGHT 30H, MCDONNELL DOUGLAS DC-10-30CF, N113WA, BOSTON-LOGAN INTERNATIONAL AIRPORT, BOSTON, MASSACHUSETTS, JANUARY 23, 1982
10 Jul. 1985 138 p Supersedes NTSB-AAR-82-15
(PB85-910406; NTSB-AAR-85-06; NTSB-AAR-82-15) Avail: NTIS HC A07/MF A01 CSCL 01C

On January 23, 1982, World Airways, Inc.,* Flight 30H, a McDonnell Douglas DC-10-30CF, was a regularly scheduled passenger flight from Oakland, California, to Boston, Massachusetts, with an en route stop at Newark, New Jersey. Following a nonprecision instrument approach to runway 15R at Boston-Logan International Airport, the airplane touched down about 2,800 feet beyond the displaced threshold of the 9,191 foot usable part of the runway. About 1936:40, the airplane veered to avoid the approach light pier at the departure end of the runway

and slid into the shallow water of Boston Harbor. The nose section separated from the fuselage in the impact after the airplane dropped from the shore embankment. Of the 212 persons on board, 2 persons are missing and presumed dead. The other persons onboard evacuated the airplane safely, some with injuries. The weather was 800 foot overcast, 2 1/2 miles visibility, with light rain and fog. The temperature was 38 F with the wind from 165 deg at 3 kms. The surface of runway 15R was covered with hard packed snow and glaze ice overlaid with rainwater. Runway braking was reported by a ground vehicle 2 hours before the accident as fair to poor; subsequently, several pilots had reported braking as poor, and one pilot had reported braking as poor to nil. Author

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-33115# Harris Corp., Melbourne, Fla.
IMPLEMENTATION OF THE SITAN ALGORITHM IN THE DIGITAL TERRAIN MANAGEMENT AND DISPLAY SYSTEM
T. M. Cambron, F. B. Snyder, and J. R. Fellerhoff (Sandia Labs., Albuquerque, N. Mex.) 1985 9 p Presented at the Natl. Aerospace and Electron. Conf., Dayton, Ohio, 20 May 1985
(Contract DE-AC04-76DP-00789)
(DE85-010659; SAND-85-0996C; CONF-8505116-2) Avail: NTIS HC A02/MF A01

The functional methodologies and development processes used to integrate the SITAN autonomous navigation algorithm with the Digital Terrain Management and Display System (DTMDS) for real time demonstrations aboard the AFTI/F-16 aircraft are described. Heretofore, the SITAN algorithm has not been implemented for real time operation aboard a military aircraft. The implementation design of the DTMDS is described along with how the elevation data base supported by the digital map generator subsystem is made available to the SITAN algorithm. The effects of aircraft motion as related to SITAN algorithm timing and processor loading are evaluated. The closed loop implementation with the AFTI aircraft inertial navigation system (INS) was specially selected for the initial demonstration. DOE

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-33116*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENERGY EFFICIENT TRANSPORT TECHNOLOGY: PROGRAM SUMMARY AND BIBLIOGRAPHY
David B. Middleton, Dennis W. Bartlett, and Ray V. Hood Sep. 1985 54 p refs
(NASA-RF-1135; L-15921; NAS 1.61:1135) Avail: NTIS HC A04/MF A01 CSCL 01C

The Energy Efficient Transport (EET) Program began in 1976 as an element of the NASA Aircraft Energy Efficiency (ACEE) Program. The EET Program and the results of various applications of advanced aerodynamics and active controls technology (ACT) as applicable to future subsonic transport aircraft are discussed. Advanced aerodynamics research areas included high aspect ratio supercritical wings, winglets, advanced high lift devices, natural laminar flow airfoils, hybrid laminar flow control, nacelle aerodynamic and inertial loads, propulsion/airframe integration (e.g., long duct nacelles) and wing and empennage surface coatings. In depth analytical/trade studies, numerous wind tunnel tests, and several flight tests were conducted. Improved computational methodology was also developed. The active control functions considered were maneuver load control, gust load alleviation, flutter mode control, angle of attack limiting, and pitch augmented stability. Current and advanced active control laws were synthesized and alternative control system architectures were developed and analyzed. Integrated application and fly by wire implementation of the active control functions were design requirements in one major subprogram. Additional EET research included interdisciplinary technology applications, integrated energy management, handling qualities investigations, reliability calculations, and economic evaluations related to fuel savings and cost of ownership of the selected improvements. Author

N85-33117# Federal Aviation Administration, Oklahoma City, Okla.
GENERAL AVIATION AIRWORTHINESS ALERTS, NO. 85
Aug. 1985 15 p
(FAA-AC-43-16; ALERT-85) Avail: NTIS HC A02/MF A01

A current listing of aircraft components and related possible modes of malfunction and failure is presented. This information is listed by aircraft make and model and is of a precautionary nature. G.L.C.

N85-33118*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FLUTTER CLEARANCE OF THE SCHWEIZER 1-36 DEEP-STALL SAILPLANE
Michael W. Kehoe and Joseph F. Ellison Aug. 1985 78 p refs
(NASA-TM-85917; Rept-85136; NAS 1.15:85917) Avail: NTIS HC A05/MF A01 CSCL 01C

A Schweizer 1-36 sailplane was modified for a controlled, deep-stall flight program. This modification allowed the horizontal stabilizer to pivot as much as 70 deg leading edge down. Ground vibration and flutter testing were accomplished on the sailplane with the horizontal stabilizer in the normal flight and deep-stall flight positions. Test results indicated satisfactory damping levels and trends for the structural modes of the sailplane. The modified sailplane was demonstrated to be free of aeroelastic instabilities to 83 KEAS with the horizontal stabilizer in the normal flight position and to 39 KEAS with the horizontal stabilizer in the deep-stall flight position. This flight envelope was adequate for the controlled, deep-stall flight experiments. Author

N85-33119*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
QUALIFICATION NEEDS FOR ADVANCED INTEGRATED AIRCRAFT
Dale A. Mackall 1985 16 p refs Presented at the AIAA Conf., Snowmass, Colo., 19-21 Aug. 1985
(NASA-TM-86731; H-1291; NAS 1.15:86731) Avail: NTIS HC A02/MF A01 CSCL 01C

In an effort to achieve maximum aircraft performance, designers are integrating aircraft systems. The characteristics of aerodynamics, vehicle structure, and propulsion systems are being integrated and controlled through embedded, often flight critical, electronic systems. The qualification needs for such highly integrated aircraft systems are addressed. Based on flight experience with research aircraft, a set of test capabilities is described which allows for complete and efficient qualification of advanced integrated aircraft. Author

N85-33120# Societe Nationale Industrielle Aerospatiale, Paris (France).
NEW MATERIALS NEEDS IN AERONAUTICS [LES BESOINS DE L'AERONAUTIQUE EN NOUVEAUX MATERIAUX]
Jacques Balazard 1985 13 p refs In FRENCH Presented at l'Avenir des Plastiques et Caoutchoucs dans les Transports SEPIC/APCT Colloq.

(SNIAS-851-502-101) Avail: NTIS HC A02/MF A01

The use of composite materials in aeronautics is discussed. The selection criteria comprising technical and economic factors are described. Cost components are outlined. Applications in aircraft and spacecraft structures are examined. The competition provided by metallurgical developments is mentioned. Author (ESA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-33121*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DEVELOPMENT OF A TEMPERATURE-COMPENSATED HOT-FILM ANEMOMETER SYSTEM FOR BOUNDARY-LAYER TRANSITION DETECTION ON HIGH-PERFORMANCE AIRCRAFT

Harry R. Chiles and J. Blair Johnson Aug. 1985 9 p refs Presented at the IEEE/CIASF Conf., Stanford, Calif., 26-28 Aug. 1985

(NASA-TM-86732; H-1292; NAS 1.15:86732) Avail: NTIS HC A02/MF A01 CSCL 01D

A hot-film constant-temperature anemometer (CTA) system was flight-tested and evaluated as a candidate sensor for determining boundary-layer transition on high-performance aircraft. The hot-film gage withstood an extreme flow environment characterized by shock waves and high dynamic pressures, although sensitivity to the local total temperature with the CTA indicated the need for some form of temperature compensation. A temperature-compensation scheme was developed and two CTAs were modified and flight-tested on the F-104/Flight Test Fixture (FTF) facility at a variety of Mach numbers and altitudes, ranging from 0.4 to 1.8 and 5,000 to 40,000 ft respectively. Author

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

No abstracts in this category.

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-33122*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DEVELOPMENT OF CONTROL LAWS FOR A FLIGHT TEST MANEUVER AUTOPILOT FOR AN F-15 AIRCRAFT

Gurbux Singh Alag and Eugene L. Duke Aug. 1985 9 p refs Presented at the AIAA Conf., Snowmass, Colo., 19-21 Aug. 1985

(NASA-TM-86736; H-1294; NAS 1.15:86736) Avail: NTIS HC A02/MF A01 CSCL 01C

An autopilot can be used to provide precise control to meet the demanding requirements of flight research maneuvers with high-performance aircraft. The development of control laws within the context of flight test maneuver requirements is discussed. The control laws are developed using eigensystem assignment and command generator tracking. The eigenvalues and eigenvectors are chosen to provide the necessary handling qualities, while the command generator tracking enables the tracking of a specified state during the maneuver. The effectiveness of the control laws is illustrated by their application to an F-15 aircraft to ensure acceptable aircraft performance during a maneuver. R.J.F.

N85-33123*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FLIGHT TEST EXPERIENCE AND CONTROLLED IMPACT OF A LARGE, FOUR-ENGINE, REMOTELY PILOTED AIRPLANE

Robert W. Kempel and Timothy W. Horton Aug. 1985 17 p refs Presented at the SFTE 16th Ann. Symp., Seattle, 29 Jul. - 2 Aug. 1985

(NASA-TM-86738; H-1298; NAS 1.15:86738) Avail: NTIS HC A02/MF A01 CSCL 01C

A controlled impact demonstration (CID) program using a large, four engine, remotely piloted transport airplane was conducted. Closed loop primary flight control was performed from a ground based cockpit and digital computer in conjunction with an up/down telemetry link. Uplink commands were received aboard the airplane and transferred through uplink interface systems to a highly modified Bendix PB-20D autopilot. Both proportional and discrete commands were generated by the ground pilot. Prior to flight tests, extensive simulation was conducted during the development of ground based digital control laws. The control laws included primary control, secondary control, and racetrack and final approach guidance. Extensive ground checks were performed on all remotely piloted systems. However, manned flight tests were the primary method of verification and validation of control law concepts developed from simulation. The design, development, and flight testing of control laws and the systems required to accomplish the remotely piloted mission are discussed. Author

N85-33124*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPLICATION OF FREQUENCY DOMAIN HANDLING QUALITIES CRITERIA TO THE LONGITUDINAL LANDING TASK

Shahan K. Sarrafian and Bruce G. Powers Aug. 1985 15 p refs Presented at the AIAA Guidance, Navigation, and Control Conf., Snowmass, Colo., 19-21 Aug. 1985

(NASA-TM-86728; H-1288; NAS 1.15:86728; AIAA-Paper-85-1848) Avail: NTIS HC A02/MF A01 CSCL 01C

Under NASA sponsorship, an in-flight simulation of the longitudinal handling qualities of several configurations for the approach and landing tasks was performed on the USAF/AFWAL Total In-Flight Simulator by the Calspan Corporation. The basic configuration was a generic transport airplane with static instability. The control laws included proportional plus integral gain loops to produce pitch-rate and angle-of-attack feedback loops. The evaluation task was a conventional visual approach to a flared touchdown at a designated spot on the runway with a lateral offset. The general conclusions were that the existing criteria are based on pitch-attitude response and that these characteristics do not adequately discriminate between the good and bad configurations of this study. This paper describes the work that has been done to further develop frequency-based criteria in an effort to provide better correlation with the observed data. Author

N85-33125*# Calspan Advanced Technology Center, Buffalo, N.Y.

THE INTERPRETATION OF FLYING QUALITIES REQUIREMENTS FOR FLIGHT CONTROL SYSTEM DESIGN Final Report, Feb. 1984 - Mar. 1985

Edmund G. Rynaski Aug. 1985 88 p refs

(NASA Order L-65611B; Contract F33615-83-C-3603)

(NASA-CR-177942; Rept-7205-8; NAS 1.26:177942) Avail: NTIS HC A05/MF A01 CSCL 01C

An experimental flight test program was designed for the Total In Flight Simulator (TIFS) directed toward the interface between flying qualities requirements and flight control system design criteria. The eventual goal is to provide an interpretation or translation of

flying qualities requirements for use by the flight control system designer. Specifically, an angle of attack and pitch rate command system matrix involving both short term and long term dynamics are specified for evaluation. Flying qualities criteria and flight control system configuration or architecture can be independent was demonstrated. Finally, additional configurations are proposed to evaluate the efficacy of dynamic decoupling. Author

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

No abstracts in this category.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-33126*# Texas A&M Univ., College Station.
FAR TRAVELERS: THE EXPLORING MACHINES
Oran W. Nicks Jun. 1985 269 p Original contains color illustrations
(Contract NASw-3557)
(NASA-SP-480; NAS 1.21:480; LC-85-1794) Avail: NTIS MF A01; SOD HC $17.00 as 033-000-00957-7 CSCL 22A

During the first two decades of space activities, unmanned spacecraft played a vital role in the initial exploration of the Moon and the planets. The spacecraft employed emerging technologies to provide extensions of man in the close-up viewing and measurement of the environment and features of Earth's interplanetary neighbors. An account of early experiences in the development and use of interplanetary vehicles is presented. Specific lunar and planetary missions (e.g., Ranger, Mariner, and Viking) are discussed. In addition, incidents highlighting the evolution of significant technologies are presented, based on personal views of people intimately involved in the efforts. Author

N85-33127# Centre National d'Etudes Spatiales, Toulouse (France).
THE FRENCH SPACE PROGRAM [PROGRAMME SPATIAL FRANCAIS]
1984 194 p refs In FRENCH Presented at 25th COSPAR Plenary Meeting, Graz, 25 Jun. - 7 Jul. 1984
Avail: NTIS HC A09/MF A01

The French space research program includes astronomy, solar physics, solar system, ionosphere, magnetosphere, meteorology, oceanography, earth resources, space geodesics, material science and life sciences. Author (ESA)

N85-33128# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE
14 Nov. 1984 157 p refs Transl. into ENGLISH from various Russian articles
(JPRS-USP-84-006) Avail: NTIS HC A08

Progress in Soviet aerospace engineering, science, and technology is reported. Topics discussed include: manned mission flights, space sciences, life sciences, space engineering, space applications, space policy and administration, and launch tables. For individual titles, see N85-33129 through N85-33165.

N85-33129# Joint Publications Research Service, Arlington, Va.
SPECIAL TOOLS USED BY COSMONAUTS IN EVA Abstract Only **c37**
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 7 Transl. into ENGLISH from Pravda (Moscow), 9 Aug. 1984 p 6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Original operations performed by cosmonauts in open space during their mission on board the orbiting station Salyut-7 are described. The preparation and methods of operations carried out by two cosmonauts during their sixth egress from the station are reported. Unique equipment, including a hand-held pneumatic press, was developed on Earth while the mission was in progress. During the open-space operation the fuel line was flattened by compressed air from the pneumatic unit. The method ensures that the line remains sealed shut for the duration of the flight. E.A.K.

N85-33130# Joint Publications Research Service, Arlington, Va.
COSMONAUTS PARTICIPATE IN MULTILEVEL REMOTE SENSING EXPERIMENT Abstract Only **c43**
N. Barskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 23 Transl. into ENGLISH from Bakinskiy Rabochiy (Maku), 30 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

An international experiment was conducted for the study of natural resources by remote methods. Photography and spectrometry of the republic's territory from orbit and the spectral characteristics of natural objects in the Sheki and Zakataly rayons and at the Mingechaur Reservoir were recorded. The aerospace experiment was conducted at several levels, ranging from equipment in orbit and instruments on board airplanes and helicopters, to a ground-based automated information-and-measurement complex. The purpose of the project is to develop scientific-methodological and physical-technical bases of environmental studies from space. The information will provide farmers with recommendations, maps and charts for the rational use of agricultural lands, pastures and reservoirs based on study of mountain-meadow, forest and valley geosystems. The materials obtained from the manned complex, correlated with data from aerial photography and ground-based observations. E.A.K.

N85-33131# Joint Publications Research Service, Arlington, Va.
SALYUT-7 COSMONAUTS WORK WITH RS-17 AND GSPS X-RAY TELESCOPES **c89**
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 32-33 Transl. into ENGLISH from Pravda (Moscow), 21 Sep. 1984 p 6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Two X-ray telescopes were tested aboard Salyut-7. The two instruments were the RS-17, and the GSPS. The X-ray sources, particularly in the Crab Nebulae and the Cygnus constellation, were observed spectrometrically. It is found that the two telescopes complement one another, the GSPS has high resolving power while the RS-17 receives the hard X-ray radiation. It is suggested that X-ray radiation accompanies the final stage of the evolution of certain stars and the processes which lead to the death of giant stars. E.A.K.

N85-33132# Joint Publications Research Service, Arlington, Va.
COMMENTS ON RS-17 X-RAY TELESCOPE Abstract Only **c89**
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 34 Transl. into ENGLISH from Vyshka (Baku), 6 Oct. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The X-ray telescopes, particularly the RS-17, record radiation in a wide range of energies--2,000 to 800,000 electron volts. These telescopes make it possible to observe black holes, X-ray pulsars and other objects, such as those in the constellation Cygnus and the Crab Nebula. Such studies are helpful in gaining a knowledge of the history of the Earth's formation and development as a planet and are important for obtaining data on the state of plasma and thermonuclear reactions in objects. E.A.K.

N85-33133# Joint Publications Research Service, Arlington, Va.
ASTRON TELESCOPE STABILIZATION SYSTEM Abstract Only **c89**
G. Tovmasyan *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 42 Transl. into ENGLISH from Kommunist (Moscow), 15 Aug. 1984 p 2 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The progress of the flight of the automatic space telescope Astron is reported and some of the features of the equipment carried by this spacecraft are outlined. It is noted that spectra with high resolution and other valuable astrophysical data are still obtained through the Astron, although it was designed to operate for only 1 year. Stabilizing system is necessary because the spectrometer's diaphragm, in which the image of an object to be observed must be captured and held, is only 40 micrometers in diameter. The telescope must therefore be aimed at this object with a permissible deviation of only a few tenths of a second of arc. The stabilization system has two operating modes. A portion of the light received from the object is used to control the system in the first mode. Photographing of objects that are several thousands of times fainter is possible in the second mode. The telescope is kept in the prescribed position by signals from a relatively bright star which is located near the object under observation. E.A.K.

N85-33134# Joint Publications Research Service, Arlington, Va.
RESULTS FROM ASTRON ORBITING TELESCOPE Abstract Only **c89**
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 43 Transl. into ENGLISH from Sov. Kirgiziya (Frunze, USSR), 20 Sep. 1984 p 2 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The largest orbiting telescope and a counter for recording X-radiation were installed on the Astron spacecraft. The constellation Andromeda was studied and it was discovered that one of its stars has a companion with a temperature of 60,000 degrees. The star's dimensions are small; its radius is less than the Earth's. Knowledge of the universe's chemistry has expanded. Information on the abundance of individual elements as far as light elements are concerned is extensive, but information regarding heavy ones is far from complete. Tremendous surpluses of lead, tungsten, uranium and thorium in the atmospheres of a number of peculiar stars were discovered. The automatic station Astron has observed more than 20 galaxies. A number of objects which have received no particular attention from astrophysicists posses powerful ultraviolet radiation. They turn out to be galaxies in the constellations Virgo and Leo. Author

N85-33135# Joint Publications Research Service, Arlington, Va.
YAKUTSK INSTITUTE'S COSMIC RAY RESEARCH FACILITY Abstract Only **c93**
B. Konovalov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 44-45 Transl. into ENGLISH from Izv. (Moscow), 3 Sep. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Progress in cosmic physics research and aeronomy is reported. Geophysical observatories and stations, test ranges and other facilities spread over a vast territory of the Yakutsk Autonomous Republic and instruments onboard satellites are outlined. The ionosphere, magnetic fields and Earth currents, cosmic rays and radio emissions, polar aurora and meteorological phenomena are studied. A large installation of the SHALL which investigates cosmic-ray showers is discussed. The creation of a unique complex for study of the ionosphere which will interconnect existing ionosphere stations near Yakutsk and in Zhigansk, a geospace-physics observatory in Tiksi, and a station which is to be created on Kotel'nyy Island is reported. It will be possible to discern from data received at central post how the solar wind is flowing around the Earth and what changes are produced in the ionosphere. The SHALL will be able to assess the radiation situation around the planet and to give accurate forecasts of shortwave radio conditions. Author

N85-33136# Joint Publications Research Service, Arlington, Va.
RADIO TELESCOPE WITH 256 ANTENNAS BUILT IN SIBERIA Abstract Only **c89**
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 46 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 7 Oct. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The building of a solar radio telescope was completed. The radio telescope is arranged in the form of a cross: 128 dish antennas lengthwise and the same number crosswise to form the cross' two beams--a north-south and an east-west one. Each beam is more than 500 meters long. Objects of study that are only 20 seconds of arc in size can be distinguished in radio representations of the Sun that are obtained with the aid of this multiple-element radio telescope. The structure and spread of the radio-frequency radiation of active regions and of flares on the Sun are studied. The new telescope will make it possible to obtain a two-dimensional, complete radio representation of the Sun every 3 or 4 minutes, in the centimeter wave band. E.A.K.

N85-33137# Joint Publications Research Service, Arlington, Va.
ASTRON X-RAY EXPERIMENT **c89**
V. G. Kurt and Ye. K. Sheffer *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 47-57 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1984 p 26-34 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The Earth satellite Astron, specially designed for astronomical observations, was put into a high-apogee orbit. The preliminary results of the work done by the X-ray telescope spectrometer mounted on the satellite are described. The aim of launching Astron is to study the stars and galaxies in the ultraviolet band of wave lengths (shorter than 3,000 A) and to observe discrete X-ray sources. Author

N85-33138# Joint Publications Research Service, Arlington, Va.
PROGRAM FOR OBSERVATIONS OF HALLEY'S COMET **c90**
Ya. S. Yatskiv and K. I. Churyumov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 58-60 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 1, Jan. - Feb. 1984 p 35-39 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

A program of research on Halley's comet from the Earth was designed to serve as a regional part of international Halley watch (IHW). The program calls for astronomical observations of Halley's comet to be carried out at 17 observatories and astrophysical observations at 15 observatories. Two specialized stations equipped with identical instruments are planned. One of these will be located on Mt. Maydanak in Uzbekistan; the second will be placed in Bolivia in the city of Tarija. Sixty-centimeter reflectors will be installed at these stations, equipped with photoelectric, spectral and polarimetric instruments. Author

N85-33139# Joint Publications Research Service, Arlington, Va.
RESULTS AND PROSPECTS OF PHYSIOLOGICAL RESEARCH DURING SPACEFLIGHTS **c52**
O. G. Gazenko *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 66-71 Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 7-11 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The development of space medicine, appearance of new problems in physiology in connection with preparation for and performance of the first spaceflights is discussed. The development of problems of space physiology makes it possible to successfully implement medical support of missions, monitor the health status of cosmonauts, use an effective enough system of preventive and readaptation measures. The results of ground based studies play a substantial part in solving many problems of space physiology. Studies conducted during spaceflights are of particular importance. The cardiac activity, vascular tonus, hemodynamics, skeletomuscular system, blood, fluid, electrolysis and hormone metabolism, condition of the central nervous system, were studied.

The physiologically validated system of preventive measures used during missions makes it possible to perform long term flights without deviations in status of vital systems that would be hazardous to man. Individual manifestations of circulatory changes in flight, course of adaptation and readaptation processes, efficacy of preventive measures are indicated. E.A.K.

N85-33140# Joint Publications Research Service, Arlington, Va.
INTRACARDIAC HEMODYNAMICS AND HUMAN HEART FUNCTION IN SIMULATED WEIGHTLESSNESS c52
Ye. B. Shulzhenko, L. I. Kakurin, A. A. Savilov, and A. M. Babin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 72-79 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 32-38 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Questions dealing with the effect of weightlessness on intracardiac hemodynamics and function of the human heart are investigated. Estimation methods of studying pumping and contractile functions of the heart were used for inflight cardiological studies. The phenomenology and mechanisms of development of changes in hemodynamics and function of the human heart during the acute period of adaptation of the cardiovascular system to simulated weightlessness were investigated. It is shown that it is possible to reproduce the redistribution of blood to vessels of the upper half of the body more fully with AOH than with hypokinesia in horizontal position. E.A.K.

N85-33141# Joint Publications Research Service, Arlington, Va.
COSMONAUTS' CARDIOVASCULAR SYSTEM FUNCTION DURING LONG-TERM ORBITAL FLIGHTS ABOARD SALYUT-6 STATION c52
A. D. Yegorov, O. G. Itsekhovskiy, I. V. Turchaninova, A. P. Alferova, A. P. Polyakova, and V. I. Bernadskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 80-88 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 55-61 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The functional stage of the cardiovascular system during long term spaceflights were evaluated by means of functional tests with use of lower body negative pressure (LBNP) and graded physical loads (GPL) on a cycle ergometer. The former test simulates orthostatic factors in weightlessness and determines readiness of postural mechanisms for gravity forces. The test evaluates the work capacity of cosmonauts according to their hemodynamic reaction to a specific physical exercise. E.A.K.

N85-33142# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL ANALYSIS OF HEART RHYTHM ASSESSMENT OF DISTINCTIVE FEATURES IN ADAPTATION TO SPACEFLIGHT CONDITIONS c52
R. M. Bayevskiy, G. A. Nikulina, and I. G. Tazetdinov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 89-98 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 62-69 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The introduction to medicine of advances in electronics, mathematics and cybernetics was discussed. Mathematical analysis of cardiac rhythm as a method of evaluating regulatory and control systems in the integral organism gained particularly broad development. The use of mathematical (cybernetic) analysis of cardiac rhythm in experimental and applied physiology, clinical practice, space and aviation medicine, sports medicine and industrial physiology, engineering psychology and balneology is described. This method is one of the newest directions in physiology and pathology of circulation and a systems approach to investigation of control processes in a living organism. E.A.K.

N85-33143# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF OSTEODYSTROPHY IN WEIGHTLESSNESS c52
A. I. Volozhin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 99-109 refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), no. 1, Jan. - Feb. 1984 p 19-27 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The exploration of space has raised for physicians and biologists an extensive range of problems, the most important of which are developing measures to prevent adverse effects resulting from prolonged sojourns under weightless conditions. Among the various pathophysiological effects of weightlessness, attention was drawn to the increased body losses of calcium, phosphorus and other elements, and also to the lowered content of minerals in the bones, as accessible to study by the modern methods of X-ray photometry and direct photon absorptiometry. It suggested that as a result of the decrease in mechanical loads on the locomotor system there is progressive loss of the body substance and a loss of strength in skeletal bone. The pathogenic effect of actual and modeled weightlessness on bone mineralization were examined. It is shown that calcium and phosphorus losses vary widely on an individual basis and depend on the duration of weightlessness. The mechanisms involved in the development of osteodystrophy occurring under conditions of prolonged hypokinesia and weightlessness are discussed. E.A.K.

N85-33144# Joint Publications Research Service, Arlington, Va.
EFFECTS OF ENVIRONMENT ON SPACECRAFT MATERIALS c18
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 113-115 Transl. into ENGLISH from the book "Vozdeystviye Okruzhayushchey Sredy na Materialy Kosmicheskikh Apparatov (Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya)" Moscow, Znaniye, no. 4, Apr. 1983 p 2-6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The processes of space environment effects on the materials of satellites, orbital and interplanetary stations determine characteristics such as operating time, reliability, work and defense functions during manned flights. Current concepts in these processes are described. The study of which will determine further progress of space exploration. E.A.K.

N85-33145# Joint Publications Research Service, Arlington, Va.
PROSPECTIVE USES FOR DIFFUSION WELDING IN VACUUM Abstract Only c37
Nikolay Fedotovich Kazakov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 116 Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 4 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The principles and features of diffusion welding in a vacuum, and some of the materials that can be welded most successfully by this method are outlined. A number of potential advantages for space welding operations, particularly the welding of metal structures are mentioned. The high vacuum of outer space and the use of the simplest devices to transmit compression pressure ensure reliable joining of various combinations of materials. It is suggested that the use of the diffusion method can shorten time for the repairing of space technology. E.A.K.

N85-33146# Joint Publications Research Service, Arlington, Va.
ONE METHOD OF SOLVING THE PROBLEM OF UNSTEADY HEAT EXCHANGE OF A BODY AND ITS ABLATION Abstract Only c34
A. F. Polyanskiy and L. I. Skurin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 117 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astronomiya (Leningrad), no. 2, Apr. 1984 p 62-66 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

A simple method is suggested for solution of the unsteady heat exchange and ablation problem. A modification of the method of straight lines with approximation of the temperature field of a body in the direction of its major motion by a cubic spline is proposed. The method is tested in a one dimensional model by

comparing it with a known precise solution for the problem of heating and ablation. In contrast to the method of grids at each calculation moment in time the profile of temperature in the body is described by a function which is continuous together with its first and second three dimensional derivatives. For heat exchange problems characteristic for hypersonic flow, only a few bands need be introduced in the direction of the major change in temperature. A significant savings in machine time is achieved since the problem can be solved by a limited number of differential equations for D sub i(t). E.A.K.

N85-33147# Joint Publications Research Service, Arlington, Va.
SPACECRAFT-AIDED RESEARCH DISCUSSED AT GEOLOGY CONGRESS Abstract Only **c46**
N. Konstantinov and Yu. Shchevyakov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 118 Transl. into ENGLISH from Turkmenskaya Iskra (Ashkhabad, USSR), 10 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

A presentation of the Space Geological Map of the USSR turned out to be one of the highlights of the 27th International Geological Congress. A discussion of problems of satellite aided geology and comparative planetology was included in the program. B. N. Mozhayev, general director of the Aerogeologiya association, discussed achievements in this field. He said that structures whose existence could only be suspected by geologists in the past become visible on the Earth's surface from the altitude of an orbital flight. This pertains primarily to ring shaped structures hundreds of kilometers in diameter, and to linear transcontinental faults of the Earth's crust which are thousands of kilometers long. More than 4,000 structures have been detected from space on the territory of the USSR and entered on maps. Soviet orbiting stations, Soyuz spaceships and satellites of the Meteor and Kosmos series are equipped with photographic and scanning instruments. MKF-6 cameras, for example, are capable not only of distinguishing details only 15 kilometers in size in a locality; they also can determine the chemical composition of rocks on the basis of remote spectrograms. Author

N85-33148# Joint Publications Research Service, Arlington, Va.
ENHANCING PRECISION OF REMOTE TEMPERATURE SENSING DATA FROM SATELLITES UNDER CLOUDY ATMOSPHERIC CONDITIONS Abstract Only **c43**
Yu. V. Plokhenko and A. B. Uspenskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 119 Transl. into ENGLISH from Issled. Zemli Iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 15-22 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Cloud cover is the major impediment to radiometric IR band measurements of thermal radiation from the Earth atmosphere system. Present algorithms for the remote determination of temperature with partial cloud cover are difficult to compare since no analysis has been made of their accuracy and the few attempts at estimating the information content and optimizing the composition of such measurements are based on considerations of a physical nature or are tied to a specific algorithm. A physical statistical model for IR measurements made in the presence of multilayer, partial cloud cover is proposed. The model is used to derive optimal estimates of the temperature distribution and the effective cloud cover density. It is assumed that the clouds can be represented by a thin absorbing layer (shield) at a specific temperature and altitude, and that the cloud layers have reflectivities close to zero. The clouds are assumed not to overlap. Cloudiness produces a sharp drop in the precision of any estimate for the atmospheric layer under the cloud cover. The information content indicator falls off as the cloud cover altitude increases. The calculations demonstrate that the accuracy of estimates of the effective cloud cover for two adjacent layers is poor, i.e., adjacent or close layers are poorly distinguishable. The precision of estimates of the effective cloud cover improves as the spacing between the levels increases and the altitude of the top layer rises. Author

N85-33149# Joint Publications Research Service, Arlington, Va.
IMPACT OF FLUCTUATIONS IN OPTICAL PROPERTIES OF ATMOSPHERE ON THE RATIO OF SPECTRAL BRIGHTNESS FROM REMOTE SENSING OF AGRICULTURAL LAND Abstract Only **c43**
Sh. A. Akhmedov and D. A. Usikov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 120 Transl. into ENGLISH from Issled. Zemli Iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 23-24 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

The data from multiband video images made from space is distorted by the atmosphere, the optical parameters of which fluctuate around average values and are generally unknown. The mean statistical error in determining the brightness ratio of a target object at two different wavelengths is determined from measurements at 0.63 and 0.57 micrometers for the cities Krasnoyarsk, Markovo, Riga, Omsk, Pechora and Gur'yev, with the average values of the optical thickness at these wavelengths and their dispersions being taken from actinometric station data. An analytical expression is derived for calculating the dispersion of this ratio. The maximum relative error reaches 10%, an amount which can be significant in research and practical applications. Author

N85-33150# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF ALTITUDE OF CLOUD COVER TOP FROM METEOR SATELLITE DATA Abstract Only **c43**
L. I. Koprova and A. Ye. Bakhamatov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 120-121 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 25-34 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

An analysis of an improved satellite measurement technique for H (upper cloud cover boundary) is presented which resolves the following problems: (1) the determination of the scope and complement of the apriori global information; (2) the generation of the requisite catalog and procedure for its timely use; (3) the automation of the identification of IR data on cloud conditions; (4) the procedure for the use of IR measurements in mapping the cloud top altitude and taking into account the effect of the atmospheric layer over the clouds on the IR measurements. The altitude determination procedure was checked by comparing synchronous radio sensing and satellite data for two regions where cloud shape and altitude differ substantially: the White Sea (1978) and the tropical latitudes of the Indian Ocean (1977). The following are summarized in extensive tables: the satellite and radio sensing data on H; the transmittance function of the atmospheric layer over the clouds as a function of latitude in both the Northern and Southern Hemispheres in July and January; the value of H based on radio sounding data and calculated from the measured radiation temperature and climatic data as well as estimates of the impact of the atmospheric layer above the clouds on the determination of H. Author

N85-33151# Joint Publications Research Service, Arlington, Va.
LANDSCAPE INTERPRETATION CAPABILITIES USING SPACE PHOTOGRAPHS OF REGIONS OF A MULTISTAGE PLATFORM MANTLE STRUCTURE Abstract Only **c43**
O. S. Obryadchikov and S. Ye. Petrov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 121-122 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 35-43 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Space photographs of such regions as the sub-Urals plateau (a semi arid plain practically devoid of vegetation) exhibit a uniform, washed out shading with little contrast. This paper analyzes the information content of such local regional space photos for the eastern part of the Caspian basin, an area with a complex structure of the lower strata of the platform mantle (down to the lower Permian inclusively) and extensively developed salt dome tectonic systems. Using the deviation of the plan view position of the lineaments from the projection onto the ground surface of the fracture faults corresponding to the lineaments revealed by deep seismic prospecting, one can determine the inclination angles of

the planes of their displacements. For the Emba and Temir river faults, these angles average 45 deg and 55 deg, respectively. While local space photos can be of practical importance in terrain interpretation when studying the deep structure and developmental history of the most complexly structured ancient platforms with a multistage mantle, careful combined analysis of space and geophysical data is still required. When geophysical data are inadequate, unambiguous interpretation of space photographs is impossible, but they will be of definite value in assisting with the planning of further ground studies. Author

N85-33152# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF MULTIBAND PHOTOGRAPHS MADE DURING TELEFOTO-80 EXPERIMENT FOR THE PURPOSE OF DISCRIMINATING AGRICULTURAL CROPS Abstract Only
c43

R. Kachinski *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 122 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 44-47 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Aerial photographs were taken from an AN-30 laboratory aircraft on July 27th, 1980 from about 2,500 m (scale of 1:20,000) with an MKF-6M camera during the Telefoto-80 experiment conducted within the framework of the Intercosmos program. The photos were interpreted to the following crops: corn, potatoes, beets, wheat, flax, meadow and pasture land, barley, oats, and rye and rape the area around the Polish villages of Kulin and Tsesazhovitse. The results of interpreting color photos of 119 fields near the former and 132 fields near the latter locations show: (1) the natural colors of crops determined visually yield the same results for rye and wheat, corn and potatoes as well as meadow and pasture lands. The incorporation of an infrared analysis channel makes it possible to discriminate between corn and potatoes, and between rye and wheat. The average identification accuracy for individual agricultural crops ranged from 86 to 100% (with the exception of oats, which was only correctly identified 35% of the time, since it was incorrectly identified as flax because of the small number of fields). Author

N85-33153# Joint Publications Research Service, Arlington, Va.
USE OF SPACE PHOTOGRAPHS FOR ANALYSIS OF STRUCTURAL AND DYNAMIC CONDITIONS OF FORMATION OF ANCIENT PHLOGOPITE AND APATITE DEPOSITS Abstract Only
c43

Kh. G. Zinatov and R. F. Vafin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 123 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 48-54 Original language document previously announced in IAA as A84-34781 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

From a tectonophysical analysis of satellite photos, the mechanism by which systems of diagonal fractures were formed in the central part of the Aldan shield is established. Reasons are also suggested to explain why the pattern has been preserved and why Precambrian fractures survived into the Phanerozoic. Attention is given to the role played by stress fields in forming structures which in the Precambrian were able to accumulate phlogopite and apatite and in the Phanerozoic ensured that these deposits were preserved. The method is shown to be applicable in regional analyses for other minerals. C.R.

N85-33154# Joint Publications Research Service, Arlington, Va.
USING REMOTE PHOTOGRAPHS IN PROSPECTING FOR HYDROCARBONS ON THE KERCH PENINSULA Abstract Only
c43

V. I. Khnykin and N. V. Kolodiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 124 Transl. into ENGLISH from from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 55-59 Original language document previously announced in IAA as A84-34782 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Satellite TV images, photographs from manned spacecraft and aerial photographs were interpreted to ascertain the configuration of lineaments in the Indolo-Kuban trough on the Kerch Peninsula. The lineaments are grouped into two systems: the first, which is the most extensive and pronounced in photographs with the greatest generalization, contains lineaments running parallel to the large tectonic structures and emphasizes individual structural elements in some cases; the second group is a system of lineaments running primarily transverse to the strike of the local folds, and can usually be traced intermittently over long distances. The latter can serve as tectonic shields for pools of hydrocarbons. Prospecting for such pools in the Nizimemaykopskiy deposits is underway on the Kerch Peninsula at the present time. It has been shown that there are no reservoirs in the crests of the structures in the southwest plain. Considering the presence of transverse fractures here, local folds in this area can be treated as consisting of individual blocks of pools. The prospecting is to be started in these blocks from the periclinal portions of the folds, considering them to be independent prospecting targets from the central portions of the structures. Author

N85-33155# Joint Publications Research Service, Arlington, Va.
CATALOGING THE SPECTRAL BRIGHTNESS COEFFICIENTS OF THE FORESTED REGION OF THE EUROPEAN TERRITORY OF THE USSR Abstract Only
c43

Yu. K. Ross and U. K. Peterson *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 124 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 60-66 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Data from ground, aircraft and helicopter measurements of the spectral brightness coefficients of the Earth's surface which were obtained during 1976 to 1982 by the Institute of Astrophysics and Atmospheric Physics of the Estonian SSR Academy of Sciences, are used to compile a catalog of these brightness factors for the northwest portion of the European area of the USSR for all seasons of the year. Three wavelengths were used: 0.550, 0.675 and 0.795 micrometers. A classification system is developed for the mapping of the surface which is comparable to the land use and land cover scheme of Anderson, et al., and corresponds to the second level of this classification in terms of the degree of detail. Some 32 different classification catagories were selected. The average values of the spectral brightness are summarized for these categories in tabular form for five periods of the year: winter, spring, summer, late summer and fall. The reliability of the catalog requires that the spectral brightness coefficients be supplemented with variation coefficients, however, there is still not sufficiently reliable data for this. Author

N85-33156# Joint Publications Research Service, Arlington, Va.
REGRESSION ANALYSIS OF AIRCRAFT AND GROUND MEASUREMENT DATA ON VEGETATION COVER Abstract Only
c43

O. Ya. Klimenko and V. V. Kozoderov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 125 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 67-75 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Data from aircraft measurements using the MKF-6 multiband camera and ground measurements of the phytometric parameters of winter wheat, e.g., the height, thickness, leaf surface area, phytomass dry and moist weight by volume, vegetative soil shading and other parameters for wheat in the Kherson test area in 1981, were subjected to regression analysis in order to determine the relationship between the remote measurements and ground measurements for the vegetation soil system. The regression analysis consisted in calculating the coefficients of the linear step by step regression, the correlation matrices and residual dispersion of the significant parameters. The findings are: (1) the inadequate precision in relating the aircraft and ground measurements to each other for the April phenophase resulted in considerable errors in the predictive model; (2) results were much better for the June phenophase when the ground data were better tied to the aircraft measurements; (3) very low correlation coefficients are noted

between the denseness and the other parameters, and the multiband brightnesses. The lack of sufficient statistical data does not now allow for an explanation; (4) a comparison of calculations based on single factor models, when the vegetation index and straight line distance was taken as the factor, showed that the results obtained for the straight line distance are substantially better. Author

N85-33157# Joint Publications Research Service, Arlington, Va.
DIRECT REGRESSION ANALYSIS OF REMOTE SENSING DATA (USING EXAMPLE OF GRASS COVER) Abstract Only c43
B. M. Balter and M. Ganzorig *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 125-126 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 76-86 Original language document previously announced in IAA as A84-34785 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

A description is given of a ground based experiment that seeks to arrive at a function linking the state of a vegetative cover used as pasture with the spectral brightness of this cover. With experimental data based on regression models, an analysis is made of the effect of various factors on such a function. In addition, the accuracy possible in evaluating the condition of the object (vegetative cover) by means of remote sensing methods is calculated. C.R.

N85-33158# Joint Publications Research Service, Arlington, Va.
INTERACTIVE PROCEDURES FOR DISCRIMINATING AND RESTORING CONTOUR LINE NETWORKS Abstract Only c43
R. I. Elman *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 126-127 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 87-97 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

In computer aided topical mapping using data derived from aerial and space photographs the contour lines comprising the structural outlines of a map can be fed into the computer in various ways (encoder, TV or optomechanical input unit). A series of interactive procedures are analyzed which allow an operator controlling a display to discriminate the sketched outline on a photograph and reproduce it on the screen of the display within the precision allowed by computer digitization errors. It is assumed that the contour outlines are sketched on the photos by the person interpreting them with white gouache paint. The discrimination of the contour lines is accomplished by either an indistinct mask or a logic mask. Following the discrimination procedures, the contour outlines in the marker display memory are in binary form. The recovery procedures are based on the use of a domain with dimensions of 3x3 store locations. The techniques and decision making rules for the reproduction of the contours are discussed in depth and illustrated with sample maps, showing the intermediate stages. Author

N85-33159# Joint Publications Research Service, Arlington, Va.
TERRAIN ILLUMINATION CONDITIONS WHEN TAKING SCANNING PHOTOGRAPHS FROM SPACE Abstract Only c43
A. M. Kuzina, I. G. Maltseva, and N. S. Ramm *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 127 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 98-106 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Expressions for the solar altitude and azimuth are derived and analyzed for terrain points at the moment they are photographed as a function of the orbital parameters of an earth resources satellite, the photograph dates, the geographic latitude of these points and their distance from the satellite track. It is assumed that the scanner photos are taken from satellites in a circular solar synchronous orbit at an altitude of 600 to 900 km, that the photos are taken during the descending orbital trajectories, i.e., when the satellite is moving southwest in the morning or noontime hours, the Earth's surface is represented by a sphere and the orbit is strictly circular and the optical spectrum is used, employing an optical mechanical scanner with linear horizontal line scanning or using a solid state MSU-E or the HRV scanner of the SPOT system. All line elements of the photos are assumed to be recorded simultaneously. It is shown that the lighting conditions are practically independent of the satellite altitude and are completely governed by the mean local time of passage of the descending orbit. Quantitative expressions are also found for the change in illumination within any scanning photo and considerations are discussed which allow recommending an optimal value for the local mean time of descending trajectory passage. Author

N85-33160# Joint Publications Research Service, Arlington, Va.
CALCULATING SOLAR HIGHLIGHT AND SHADELESS AREAS FOR SCANNING PHOTOGRAPHS FROM SPACE AND OPTIMIZING LIGHTING CONDITIONS Abstract Only c43
I. G. Maltseva *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 128 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 107-116 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Light scattering by natural landscape objects exhibits two maxima which fall within the vertical plane having an azimuth coincident with the azimuth of the Sun. The first maximum corresponds to the direction of the solar rays (the unshaded region) and the second to the direction of the mirror reflection of these rays from the horizontal plane (the highlighting region). In these two regions, the brightness coefficients of the majority of terrain elements increase sharply and become strongly variable, while the contrasts between different objects as a rule decrease. The images of terrain objects in these regions yield the maximum information on the scattering indices of the objects. These two regions are described as applied to the case of multispectrum space scanner photography from earth resources satellites and the optimization of the ground illumination conditions. The analysis is based on the geometry of the Sun-satellite-Earth surface system and also treats the question of the duration of the space photography season and its dependence on lighting conditions. Equations are solved for the isolines and centers of the shadeless and high-light regions. Author

N85-33161# Joint Publications Research Service, Arlington, Va.
DISCRIMINATION OF LINEAR CONTOUR ELEMENTS OF SPACE PHOTOGRAPHS BASED ON VISUAL PERCEPTION MODEL Abstract Only c43
M. V. Smirnov and L. N. Rozanov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 129 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 117-124 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Formalization of the description of such objects as lineaments on space photographs in the case of visual interpretation must be based on some model of visual perception. An algorithm constructed from such a model will be heuristic. It is argued that the optimization of the heuristic algorithm is possible using the statistical properties of the images. A model using the following sequence of operations is proposed: in each iteration, the dynamic range of variation in the brightness is subjected to logarithmic transformation; after this, a filter emphasizes all density gradients and simultaneously provides isotropic smoothing; the range of values of the filtered image is then subjected to an exponential transformation. The last image into lines (ascertaining the skeletal outline). A block diagram of the proposed model, as well as the frequency response of the filters used, are given. The transition is made from the qualitative model to a statistical one for certain parameters of the heuristically developed algorithm, based on the physical characteristics of the transformed space photographs. Author

N85-33162# Joint Publications Research Service, Arlington, Va.
PHYSICO-GEOGRAPHICAL REGIONALIZATION OF CASPIAN LOWLAND BASED ON SPACE SURVEY MATERIALS Abstract Only c43
I. V. Kopyl and V. A. Nikolayev *In its* USSR Rept.: Space

(JPRS-USP-84-006) 14 Nov. 1984 p 130 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 1, Jan. - Feb. 1984 p 65-70 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Imagery from Salyut-4 and Meteor and other satellites was used to establish regionalization through analysis of functional internal structures of the natural geosystems consisting of conjunctions of spatial and genetic landscape complexes. Each characteristic physico-geographical area has dominant landscapes shown in the imagery by patterns which can be analyzed according to geometry, optical density, boundaries and other features. The original sea level in the Caspian lowland, has in parts, been affected by exogenous processes such as erosion, eolianism and undermining producing Baer formations and dendritic, striated, spotted, circular-concentric and other identifiable shapes. The regional pattern is built up from textures of landscapes and their morphological subunits. The area breaks down into semi-desert and desert subregions and land use modifications such as agricultural and pasture use are visible. Large scale morphostructural and zonation lineaments as well as paleogeographical features are often visible. Regionalization is more precise and detailed and shows complex interrelations better than previous versions and can be applied for agricultural, reclamation, conservation and other purposes. Author

N85-33163# Joint Publications Research Service, Arlington, Va.
MAPPING OF DYNAMICS OF DELTAS BY SPACE PHOTOGRAPHY Abstract Only **c43**
O. N. Yefremova and V. I. Kravtsova *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 130-131 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 1, Jan. - Feb. 1984 p 70-81 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

River delta region dynamics based upon hydromorphological development processes, delta movements seawards and river flow were studied by means of space imagery deltas from Meteor-Priroda and LANDSAT satellite scanners with medium (240 m) and high (80 m) resolution and from Salyut orbital station photos with 30 m resolution. Delta development was shown by map series using survey mapping of present conditions as the reference. Scanner photos from earth resources and meteorological satellites were used to map seasonal variations. Photos retaken with the same technology several years later allowed representation and comparison of changes and analysis of dynamics due to hydrodynamic systems and agricultural and reclamation activities, and the identifications of delta movements, appearance of spits and bars and channel variations. Delta histories were studied over longer periods by means of topographic survey maps from the 1940 to 1950's or even 19th century military maps. Geomorphological and landscape characteristics were studied by means of space imagery mapping showing relief features; ground studies identified development stages. The practical value of space imagery for mapping was demonstrated. Author

N85-33164# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE MAPPING OF ARID TERRITORIES OF ARIZONA USING SPACE PHOTOGRAPHY Abstract Only **c43**
Ye. V. Glushko and T. I. Kondratyeva *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 131 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 3, May - Jun. 1984 p 72-77 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Cartographic work to compile maps of the arid part of Arizona from space photographs is described. Work was done from a picture obtained from the LANDSAT 1 satellite using a multispectral scanning system. The picture was taken at a height of 915 km. at a scale of 1:3,360,000 with a spatial resolution of 70 meters and covers an area of 34 square kilometers. Decoding was done from synthesized color images in the spectral ranges 0.5 to 0.6 micrometers (green), 0.6 to 0.7 micrometers (red), and 0.8 to 1.1 micrometers (near infrared) using a working scale of 1:1,000,000. The intial map, clearly showing the higher belt of the piedmont and the southwest edge of the Colorado Plateau, was used to compile geomorphological, soil, geobotanical and land usage maps of the same area. Features of the thematic maps are described. It is suggested that the large scale use of space photography could be useful in compiling photographic maps of the USSR at a scale of 1:1,000,000. It is asserted that the use of space methods facilitates improvements in geographical cartography, which can then also be used to compile thematic maps. Photomapping is acquiring increasing importance in monitoring the natural environment. Author

N85-33165# Joint Publications Research Service, Arlington, Va.
REPETITION OF DENSE CLOUD COVER ABOVE INDIAN OCEAN FROM GENERALIZED SATELLITE DATA Abstract Only **c43**
R. V. Abramov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 132 Transl. into ENGLISH from Izv. Vsesoyuznogo Geograficheskogo Obshchestva (Leningrad), v. 116, no. 2, Mar. - Apr. 1984 p 138-144 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

Using as a data base information contained in the USSR Hydrometeorological Center maps compiled during the period 1967 to 1971 (produced from pictures obtained by Soviet and U.S. satellites for the purpose of petroleum analysis) an attempt was made to determine patterns of repetition in dense cloud cover above the Indian Ocean (latitude 30 deg south to 30 deg north, longitude 30 deg east to 150 deg east) and the association (if any) between cloud type and cloud cover. It was found that the cloud cover repetition patterns during the survey pericd (1967 to 1971) was most marked in the region of the equator, reaching 25 to 26% between 92 deg east and 96 deg east. In the median field cloud cover repetition reached approximately 10.6%. Patterns over the Indian Ocean are compared with similar patterns over the Atlantic and Pacific oceans, and the significance of cloud cover patterns on global thermal flows is discussed. Cloud types were analyzed. It was found that the dominant type overall above the Indian Ocean is cumuliform, which does not usually form dense cloud covers. Dense covers of cumulus dominate in the east equatorial and Arabian Sea zones. Stratiform and cirrus frequently accompany cumulus. It is concluded that most of the dense cloud cover in the Southern Hemisphere occurs in the equatorial region and that the Southern Hemisphere is still the major recipient of solar heat. Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N85-33166# Los Alamos National Lab., N. Mex.
A METHOD OF ACCURIZING RAIL GUNS
Eugene H. Farnum Jun. 1984 13 p refs
(LA-10028-MS) Avail: NTIS HC A02/MF A01

In space, projectiles with hypervelocity can deliver large amounts of energy to the target. Long range and high accuracy

are essential. This report presents a method of improving the accuracy of hypervelocity vehicles by measuring the output velocity and correcting the direction by impulse from a laser beam normal to the projectile flight path. The accurizer is described, trajectory correction calculations are given, and maximum practical trajectory corrections are suggested for low and high mass projectiles. Assumptions are detailed, areas of further study, indicated. Author

N85-33167# Materials Research Labs., Melbourne (Australia).
USE OF THE COMPUTER PROGRAM PARA 80 TO STUDY RESULTS FROM FIRING THE RAILGUN ERGS-1M
D. D. Richardson and R. A. Marshall Aug. 1983 28 p refs
(MRL-R-900; AR-003-793) Avail: NTIS HC A03/MF A01

Comparisons are made between railgun performance predictions made by using the computer code PARA 80, and the experimental data obtained during a series of firings of the ERGS-1M railgun. It is shown that relatively simple calculations presently give as much insight as detailed computer codes. This is expected to remain so until rigorous determinations of inductance per unit length of railgun rails have been obtained. B.W.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-33168*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A SURVEY OF STRUCTURAL MATERIAL ISSUES FOR A SPACE STATION
Jane A. Hagaman Washington Aug. 1985 24 p refs
(NASA-TM-86385; L-15806; NAS 1.15:86385) Avail: NTIS HC A02/MF A01 CSCL 22B

As NASA enters the definition phase of the space station project, one of the important issues to be considered is structural material selection. The complexity of the space station and its long life requirement are two key factors which must be considered in the material selection process. Both aluminum and graphite/epoxy are considered as potential structural materials. Advantages and disadvantages of these materials with respect to mechanical and thermal considerations, space environment, manufacturing, and cost are discussed. R.J.F.

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-33169*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PROCEDURE FOR ESTIMATING ORBITAL DEBRIS RISKS
James L. Crafts and James P. Lindberg Aug. 1985 11 p refs
(NASA-TP-2507; M-495; NAS 1.60:2507) Avail: NTIS HC A02/MF A01 CSCL 22A

A procedure for estimating the potential orbital debris risk to the world's populace from payloads or spent stages left in orbit on future missions is presented. This approach provides a consistent, but simple, procedure to assess the risk due to random reentry with an adequate accuracy level for making programmatic decisions on planned low Earth orbit missions. Author

N85-33170*# General Electric Co., Philadelphia, Pa. Space Systems Div.
SPACE STATION AUTOMATION STUDY. AUTOMATION REQUIREMENTS DERIVED FROM SPACE MANUFACTURING CONCEPTS. VOLUME 1: EXECUTIVE SUMMARY Final Report
9 Jul. 1984 34 p
(Contract NAS5-25182)
(NASA-CR-176099; NAS 1.26:176099) Avail: NTIS HC A03/MF A01 CSCL 22B

The two manufacturing concepts developed represent innovative, technologically advanced manufacturing schemes. The concepts were selected to facilitate an in depth analysis of manufacturing automation requirements in the form of process mechanization, teleoperation and robotics, and artificial intelligence. While the cost effectiveness of these facilities has not been analyzed as part of this study, both appear entirely feasible for the year 2000 timeframe. The growing demand for high quality gallium arsenide microelectronics may warrant the ventures.
Author

N85-33171*# General Electric Co., Philadelphia, Pa. Space Systems Div.
SPACE STATION AUTOMATION STUDY. AUTOMATION REQUIREMENTS DERIVED FROM SPACE MANUFACTURING CONCEPTS. VOLUME 2: TECHNICAL REPORT Final Report
27 Nov. 1984 125 p
(Contract NAS5-25182)
(NASA-CR-176100; NAS 1.26:176100) Avail: NTIS HC A10/MF A01 CSCL 22B

The automation technology required for remote operations, including manufacturing applications were assessed. Over one hundred potential space station missions were assessed through an extensive review of proposed space station experiments and manufacturing concepts. Two manufacturing design concepts were developed: (1) gallium arsenide electroepitaxial crystal production and wafer manufacturing facility; and (2) gallium arsenide VLSI microelectronics chip processing facility. A functional overview of the ultimate design concept incorporating the two manufacturing facilities on space station are provided. The concepts were studied separately. This separation allowed conclusions and results to be determined in independent time frames without dependent cross ties. The conclusions and results are discussed in detail. E.R.

N85-33172*# Boeing Aerospace Co., Seattle, Wash.
SPACE STATION AUTOMATION AND ROBOTICS STUDY. OPERATOR-SYSTEMS INTERFACE Final Report
Nov. 1984 72 p refs Sponsored by NASA. Johnson Spacecraft Center Prepared in cooperation with Boeing Computer Services, Inc., Seattle
(NASA-CR-176095; NAS 1.26:176095; D483-10027-1) Avail: NTIS HC A04/MF A01 CSCL 22B

This is the final report of a Space Station Automation and Robotics Planning Study, which was a joint project of the Boeing Aerospace Company, Boeing Commercial Airplane Company, and Boeing Computer Services Company. The study is in support of the Advanced Technology Advisory Committee established by NASA in accordance with a mandate by the U.S. Congress. Boeing support complements that provided to the NASA Contractor study team by four aerospace contractors, the Stanford Research Institute (SRI), and the California Space Institute. This study identifies automation and robotics (A&R) technologies that can be advanced by requirements levied by the Space Station Program. The methodology used in the study is to establish functional requirements for the operator system interface (OSI), establish the technologies needed to meet these requirements, and to forecast the availability of these technologies. The OSI would perform path planning, tracking and control, object recognition, fault detection and correction, and plan modifications in connection with extravehicular (EV) robot operations. F.M.R.

N85-33173*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
TESTIMONY OF ROBERT A. FROSCH BEFORE THE SUBCOMMITTEE ON HUD AND INDEPENDENT AGENCIES OF THE SENATE COMMITTEE ON APPROPRIATIONS
Robert A. Frosch 14 Mar. 1985 4 p
(NASA-TM-87496; NAS 1.15:87496) Avail: NTIS

HC A02/MF A01 CSCL 22B

An agreement between NASA and the Congress was arranged part of the activities supporting the establishment of NASA Policy on Automation and Robotics for the space station. This agreement is discussed. A panel brought together experts from industry, universities, national laboratories, other government agencies, and NASA to perform an independent study of how NASA could use automation and robotics in the space station in ways that would be most useful to carrying out the mission of the station, and that would lead to useful benefits to the U.S. economy and industry on the ground. Author

N85-33174*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,

STATEMENT OF AARON COHEN, DIRECTOR, RESEARCH AND ENGINEERING, JOHNSON SPACE CENTER AND CHAIRMAN, SPACE STATION ADVANCED TECHNOLOGY ADVISORY COMMITTEE, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, BEFORE THE SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE, COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION, UNITED STATES SENATE

Aaron Cohen 8 Mar. 1985 14 p

(NASA-TM-87497; NAS 1.15:87497) Avail: NTIS HC A02/MF A01 CSCL 22B

The activities of NASA's Space Station Advanced Technology Advisory Committee is discussed. Advanced Technology Advisory Committee (ATAC) activities over the last year are reviewed in preparation of the report to Congress on the potential for advancing automation and robotics technology for the space station and for the U.S. economy. Author

N85-33175*# Martin Marietta Aerospace, Denver, Colo.

SPACE STATION AUTOMATION STUDY: AUTONOMOUS SYSTEMS AND ASSEMBLY, VOLUME 2 Final Report

K. Z. Bradford Nov. 1984 254 p refs 2 Vol.

(Contract NAS8-35042)

(NASA-CR-176092; NAS 1.26:176092) Avail: NTIS HC A12/MF A01 CSCL 22B

This final report, prepared by Martin Marietta Denver Aerospace, provides the technical results of their input to the Space Station Automation Study, the purpose of which is to develop informed technical guidance in the use of autonomous systems to implement space station functions, many of which can be programmed in advance and are well suited for automated systems. F.M.R.

N85-33176*# Stanford Univ., Calif.

SPACE ROBOT SIMULATOR VEHICLE Final Report, Mar. 1984 - Mar. 1985

Robert H. Cannon, Jr. and Harold Alexander May 1985 20 p refs Prepared in cooperation with JPL, Pasadena, Calif. Original contains color illustrations

(Contract NAS7-100)

(NASA-CR-176133; JPL-9950-1162; NAS 1.26:176133) Avail: NTIS HC A02/MF A01 CSCL 22B

A Space Robot Simulator Vehicle (SRSV) was constructed to model a free-flying robot capable of doing construction, manipulation and repair work in space. The SRSV is intended as a test bed for development of dynamic and static control methods for space robots. The vehicle is built around a two-foot-diameter air-cushion vehicle that carries batteries, power supplies, gas tanks, computer, reaction jets and radio equipment. It is fitted with one or two two-link manipulators, which may be of many possible designs, including flexible-link versions. Both the vehicle body and its first arm are nearly complete. Inverse dynamic control of the robot's manipulator has been successfully simulated using equations generated by the dynamic simulation package SDEXACT. In this mode, the position of the manipulator tip is controlled not by fixing the vehicle base through thruster operation, but by controlling the manipulator joint torques to achieve the desired tip motion, while allowing for the free motion of the vehicle base. One of the primary goals is to minimize use of the thrusters in favor of intelligent control of the manipulator. Ways to reduce the computational burden of control are described. E.A.K.

N85-33177*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

A REVIEW OF SHOCK WAVES AROUND AEROASSISTED ORBITAL TRANSFER VEHICLES

Chul Park Jun. 1985 33 p refs

(NASA-TM-86769; Rept-85277; NAS 1.15:86769) Avail: NTIS HC A03/MF A01 CSCL 22B

Aeroassisted orbital transfer vehicles (AOTVs) are a proposed type of reusable spacecraft that would be used to transport cargoes from one Earth-bound orbit to another. Such vehicles could be based on the proposed space station and used to transport commercial satellites from the space station to geostationary orbits or to polar orbits and return. During a mission, AOTVs would fly through Earth's atmosphere, thus generating aerodynamic forces that could be used for decelerating the vehicles or changing their direction. AOTV research findings were concerned with the shock-wave-induced, high-temperature airflows that would be produced around these vehicles during atmospheric flight. Special emphasis was placed on the problems of: (1) the chemical physics of multitemperature, ionizing, nonequilibrium air flows, and (2) the dynamics of the flows in the base region of a blunt body with complex afterbody geometry. Author

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N85-33178# Institut Franco-Allemand de Recherches, St. Louis (France).

TELEMETRY SYSTEM FOR THE TRANSMISSION OF DATA FROM PROJECTILES DURING THE ACCELERATION PHASE IN THE GUN BARREL [TELEMETRIESYSTEM ZUR UEBERTRAGUNG VON MESSWERTEN AUS GESCHOSSEN WAEHREND DER BESCHLEUNIGUNGSPHASE IM ROHR]

V. Wegner 28 May 1984 16 p refs In GERMAN Presented at Europaeischen Telemetrie-Konf., Boeblingen, West Ger., May 1984

(ISL-CO-207/84) Avail: NTIS HC A02/MF A01

A ballistic telemetry system reliable for accelerations up 100,00 g was developed. It consist of industrially produced thick layer 10 mm x 10 mm components which can be assembled to a telemetry system according to the unit box principle depending on user requirements. The electronic circuits are fixed in the gun barrel with epoxy resin. The short time phenomena and the limited space require analog data transmission. The 30 mm barrels used for interior ballistics tests and the block diagram of the measuring system are described. The results of the axial acceleration measurements show very clearly the effect of the injection resistance at the beginning of the projectile motion, and by integration provide the temporal evolution of the projectile velocity in the barrel. The measurements of the transverse acceleration clearly show the effect of the barrel curvature and the gravitational force. A wire and an optoelectronic transmission system were developed. Author (ESA)

N85-33321# Joint Publications Research Service, Arlington, Va.

VATRA TELEVISION COMPLEX FOR SALYUT ORBITAL SPACE STATION Abstract Only

Ya. G. Brativnk, D. P. Brilliantov, and V. V. Movchan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 5 Transl. into ENGLISH from Tekhn. Kino Televideniya (Moscow), no. 6, Jun. 1984 p 3-5 (For primary document see N85-33314 22-33)

Avail: NTIS HC A05/MF A01

N85-33382# Joint Publications Research Service, Arlington, Va.
ON THE PRINCIPLE OF UNIFORMITY OF SATELLITE COMMUNICATIONS SYSTEMS Abstract Only
L. Ya. Kantor *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 1 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 10, Oct. 1983 p 23-26 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33383# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL PROTOTYPE NETWORK IN DUBNA EXPERIMENTAL SATELLITE COMMUNICATIONS SYSTEM Abstract Only
V. L. Bykov, Ye. Aleksandrova, B. Balabanov, V. Bauer, Sh. Berto, K.-D. Vantke, I. Vit, A. Kavetski, V. Liebsch, V. V. Svyatogor et al *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 2 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 10, Oct. 1983 p 27-32 Previously announced as X84-72881 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-33179*# Hydraulic Research Textron, Irvine, Calif. Systems Engineering Div.
RESEARCH AND DEVELOPMENT ACTIVITIES IN UNIFIED CONTROL-STRUCTURE MODELING AND DESIGN
Arunkumar P. Nayak 23 Jul. 1985 37 p Prepared in cooperation with JPL, Pasadena, Calif.
(Contract NAS7-918)
(NASA-CR-176129; JPL-9950-1167; NAS 1.26:176129; Rept-956541-Ext-2) Avail: NTIS HC A03/MF A01 CSCL 22B

Results of work to develop a unified control/structures modeling and design capability for large space structures modeling are presented. Recent analytical results are presented to demonstrate the significant interdependence between structural and control properties. A new design methodology is suggested in which the structure, material properties, dynamic model and control design are all optimized simultaneously. Parallel research done by other researchers is reviewed. The development of a methodology for global design optimization is recommended as a long-term goal. It is suggested that this methodology should be incorporated into computer aided engineering programs, which eventually will be supplemented by an expert system to aid design optimization. B.W.

N85-33180*# Hydraulic Research Textron, Irvine, Calif. Systems Engineering Div.
RESEARCH AND DEVELOPMENT ACTIVITIES IN UNIFIED CONTROL-STRUCTURE MODELING AND DESIGN
Arunkumar P. Nayak 3 May 1985 29 p ref Prepared in cooperation with JPL, Pasadena, Calif.
(Contract NAS7-918)
(NASA-CR-176111; JPL-9950-1144; NAS 1.26:176111; Rept-956541-Ext-2) Avail: NTIS HC A03/MF A01 CSCL 22B

Results of work sponsored by JPL and other organizations to develop a unified control/structures modeling and design capability for large space structures is presented. Recent analytical results are presented to demonstrate the significant interdependence between structural and control properties. A new design methodology is suggested in which the structure, material properties, dynamic model and control design are all optimized simultaneously. The development of a methodology for global design optimization is recommended as a long term goal. It is suggested that this methodology should be incorporated into computer aided engineering programs, which eventually will be supplemented by an expert system to aid design optimization. Recommendations are also presented for near term research activities at JPL. The key recommendation is to continue the development of integrated dynamic modeling/control design techniques, with special attention given to the development of structural models specially tailored to support design. Author

N85-33181*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DEPLOYABLE-ERECTABLE TRADE STUDY FOR SPACE STATION TRUSS STRUCTURES
Martin M. Mikulas, Jr., Andrew S. Wright, Jr., Harold G. Bush, Judith J. Watson, Edwin B. Dean, Leonard T. Twigg, Marvin D. Rhodes, Paul A. Cooper, John T. Dorsey, and Mark S. Lake Jul. 1985 200 p refs
(NASA-TM-87573; NAS 1.15:87573) Avail: NTIS HC A09/MF A01 CSCL 22B

The results of a trade study on truss structures for constructing the space station are presented. Although this study was conducted for the reference gravity gradient space station, the results are generally applicable to other configurations. The four truss approaches for constructing the space station considered in this paper were the 9 foot single fold deployable, the 15 foot erectable, the 10 foot double fold tetrahedral, and the 15 foot PACTRUSS. The primary rational for considering a 9 foot single-fold deployable truss (9 foot is the largest uncollapsed cross-section that will fit in the Shuttle cargo bay) is that of ease of initial on-orbit construction and preintegration of utility lines and subsystems. The primary rational for considering the 15 foot erectable truss is that the truss bay size will accommodate Shuttle size payloads and growth of the initial station in any dimension is a simple extension of the initial construction process. The primary rational for considering the double-fold 10 foot tetrahedral truss is that a relatively large amount of truss structure can be deployed from a single Shuttle flight to provide a large number of nodal attachments which present a pegboard for attaching a wide variety of payloads. The 15 foot double-fold PACTRUSS was developed to incorporate the best features of the erectable truss and the tetrahedral truss. B.W.

N85-33182# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite, Data, and Information Service.
THE SPACE STATION POLAR PLATFORM: NOAA SYSTEMS CONSIDERATIONS AND REQUIREMENTS
John H. McElroy and Stanley R. Schneider Jun. 1985 168 p refs
(NOAA-TR-NESDIS-22) Avail: NTIS HC A08/MF A01

The systems considerations that must be taken into account for NOAA to utilize the Polar Platform are presented. Issues addressed include overall systems configuration, instrument assemblies, support subsystems, communication links, servicing, orbits, altitudes, ground data processing, archiving of data, international participation, and organizational roles and responsibilities. Author

N85-33183# Societe Nationale Industrielle Aerospatiale, Cannes (France).
STUDY AND REALIZATION OF A COMMAND SYSTEM ADAPTED TO SPACE ROBOTICS Thesis - Nice Univ. [ETUDE ET REALISATION D'UN SYSTEME DE COMMANDE ADAPTE A LA ROBOTIQUE SPATIALE]
Michel Fouquet 1985 170 p refs In FRENCH
(SNIAS-851-440-106) Avail: NTIS HC A08/MF A01

A model of the command system and the manipulation arm of a space station robot was implemented. The main characteristics of the arm are an anthropomorphic design with six degrees of freedom and components with narrow section and considerable length. The mathematical models and algorithms used are described. The trajectory computation in the space of the articulation variables is examined. The computer architecture

consists of two multiprocessor computers interacting through a connecting bus. The experimental manipulations performed are described. Author (ESA)

N85-33144# Joint Publications Research Service, Arlington, Va.
EFFECTS OF ENVIRONMENT ON SPACECRAFT MATERIALS
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 113-115 Transl. into ENGLISH from the book "Vozdeystviye Okruzhayushchey Sredy na Materialy Kosmicheskikh Apparatov (Novoye v Zhizni, Nauke, Tekhnike: Seriya Kosmonavtika, Astronomiya)" Moscow, Znaniye, no. 4, Apr. 1983 p 2-6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N85-33184*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THE DESIGN, DEVELOPMENT, TESTING, FABRICATION, CALIBRATION AND INTEGRATION OF A HIGH RESOLUTION IMAGER (HRI) FOR THE ROENTGEN SATELLITE (ROSAT) Progress Report, 1 Dec. 1984 - 28 Feb. 1985
John W. Gerdes 15 Apr. 1985 9 p
(Contract NASw-3722)
(NASA-CR-175302; NAS 1.26:175302; PR-9) Avail: NTIS HC A02/MF A01 CSCL 22B

The development, calibration and integration of the high resolution imager (HRI) for the Roentgen Satellite (ROSAT) is discussed. E.A.K.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-33185*# Rocket Research Corp., Redmond, Wash.
VOYAGER 0.2-lbf THRUSTER VALVE ASSEMBLY SHORT PULSE TEST REPORT
D. R. Johnson 29 Apr. 1985 83 p Prepared for JPL, Pasadena, Calif.
(Contract JPL-957181; JPL Proj. 9950-1141)
(NASA-CR-176121; NAS 1.26:176121; RRC-85-R-999) Avail: NTIS HC A05/MF A01 CSCL 21H

The short pulse width testing completed on the Voyager 0.2-lbf thruster value assemblies (T/VA's) and the disassembly and inspection of T/VA S/N 020 is reported. The purpose for performing the short pulse width testing on Voyager 0.2-lbf thruster valve assemblies (T/VA's) was to determine: (1) impulse bit versus electrical pulse width; (2) impulse bit variations versus electrical pulse width; and (3) whether the short pulses decrease thruster life. E.A.K.

N85-33186*# BDM Corp., McLean, Va.
ADVANCED BEAMED-ENERGY AND FIELD PROPULSION CONCEPTS Final Report
L. N. Myrabo 31 May 1983 545 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-918; JPL-956396; JPL Proj. 9950-1082)
(NASA-CR-176108; NAS 1.26:176108; BDM/W-83-225-TR) Avail: NTIS HC A23/MF A01 CSCL 21H

Specific phenomena which might lead to major advances in payload, range and terminal velocity of very advanced vehicle propulsion are studied. The effort focuses heavily on advanced propulsion spinoffs enabled by current government-funded investigations in directed-energy technology: i.e., laser, microwave, and relativistic charged particle beams. Futuristic (post-year 2000) beamed-energy propulsion concepts which indicate exceptional promise are identified and analytically investigated. The concepts must be sufficiently developed to permit technical understanding of the physical processes involved, assessment of the enabling technologies, and evaluation of their merits over conventional systems. Propulsion concepts that can be used for manned and/or unmanned missions for purposes of solar system exploration, planetary landing, suborbital flight, transport to orbit, and escape are presented. Speculations are made on the chronology of milestones in beamed-energy propulsion development, such as in systems applications of defense, satellite orbit-raising, global aerospace transportation, and manned interplanetary carriers. Author

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-33187* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYNTHESIS OF 2,4,8,10-TETROXASPIRO[5,5]UNDECANE Patent
Algirdas C. Poshkus, inventor (to NASA) (NAS/NRC, Washington) 9 Jul. 1985 5 p Filed 3 Sep. 1980 Supersedes N80-31472 (18 - 22, p 2964)
(NASA-Case-ARC-11243-2; US-Patent-4,528,386; US-Patent-Appl-SN-183707; US-Patent-Class-549-335) Avail: US Patent and Trademark Office CSCL 07C

Pentaerythritol is converted to its diformal, 2,4,8,10-tetroxaspirol [5.5]undecane, by heating it to a temperature within the range of about 110 to 150 C, for a period of up to 10 minutes, in the presence of a slight excess of paraformaldehyde and of a catalytic quantity of an acid catalyst such as sulfuric acid. The reaction may be carried out in two steps, by forming first the monoformal, then the diformal. In any case, total reaction time is about 10 minutes, and yield of diformal are greater than 90%. Previous processes require hours or days, and often, tedious operating procedures. Author

N85-33188 Defence Research Information Centre, Orpington (England).
STRUCTURE AND FUNCTIONS OF ULTRA-THIN FILMS OF ORGANIC COMPOUNDS
Seizo Miyata and Tomohisa Nishikawa Mar. 1985 27 p refs Transl. into ENGLISH from Hyomen (Japan), vol. 22, no. 8, 1984 p 474-481
(DRIC-T-7481; BR95443) Copyright. Avail: NTIS HC A03/MF A01

Methods of manufacturing ultrathin films, and investigation of their structures and properties are reviewed. Ultrathin films are defined as films with a thickness of several hundred Angstroms or less, whose surface properties predominate over their bulk properties. The Langmuir-Blodgett wet process method; vacuum deposition; sputtering; plasma polymerization; ion plating; and molecular beam epitaxy are described. Increasing utilization in optoelectronic devices is forecast. Author (ESA)

N85-33189*# Indiana Univ., Bloomington. Biogeochemical Labs.
ISOTOPIC BIOGEOCHEMISTRY Progress Report, 1 Jun. 1981 - 30 Apr. 1985
John M. Hayes 1985 34 p
(Grant NGR-15-003-118)
(NASA-CR-176128; NAS 1.26:176128; PR-CPPS-31) Avail: NTIS HC A03/MF A01 CSCL 07C

An overview is provided of the biogeochemical research. The

funding, productivity, personnel and facilities are reviewed. Some of the technical areas covered are: carbon isotopic records; isotopic studies of banded iron formations; isotope effects in microbial systems; studies of organic compounds in ancient sediments; and development in isotopic geochemistry and analysis. E.R.

N85-33190# Department of the Air Force, Washington, D.C.
SOIL EXTRACTION KIT Patent Application
J. R. Aldrich, inventor (to Air Force) Filed 29 Jan. 1985 13 p
(AD-D011736; US-Patent-Appl-SN-696129) Avail: NTIS HC A02/MF A01 CSCL 07/1

A method and apparatus is disclosed for producing an extract for testing substances including soil and water for contamination by polychlorinated biphenyl (PCB), using commercially available test units which are normally limited to testing transformer oils. The method consists of: taking a sample of a substance suspected of PCB contamination; mixing it with an equal mass of hexane solvent in a sample bottle; and shaking the sample bottle by hand for 30 seconds to yield a hexane extract. The hexane extract is then analyzed using the commercially available field test kit. Finally, the results yielded by the commercially available field test kit are multiplied by a scaling factor to yield an estimate of the actual amount of PCB contamination in the sample. GRA

N85-33191# Suntech, Inc., Marcus Hook, Pa.
METHOD FOR REMOVING CHLORINE COMPOUNDS FROM HYDROCARBON MIXTURES Patent Application
E. J. Janoski and E. J. Hollstein, inventors (to DOE) Filed 29 Sep. 1984 10 p
(Contract DE-AC01-78ET-11041)
(DE85-011608; US-Patent-Appl-SN-655598) Avail: NTIS HC A02/MF A01

A process for removing halide ions from a hydrocarbon feedstream containing halogenated hydrocarbons wherein the contaminated feedstock is contacted with a solution of a suitable oxidizing acid containing a lanthanide oxide. It is necessary that the acid is present in a concentration of at least about 50 weight percent for a time sufficient to remove substantially all of the halide ion from the hydrocarbon feedstock. DOE

N85-33192# Oak Ridge National Lab., Tenn.
SEVENTH SYMPOSIUM ON BIOTECHNOLOGY FOR FUELS AND CHEMICALS: PROGRAM AND ABSTRACTS
1985 99 p Symp. held at Gatlinburg, Tenn., 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-011197; CONF-850513-Absts) Avail: NTIS HC A05/MF A01

Abstracts of papers and poster sessions presented at the Symposium are given. Sessions addressed the following topics: thermal/chemical processing; applied microbial research; innovative bioconversion systems; bioprocess engineering; and future trends in biotechnology. DOE

N85-33193# Massachusetts Inst. of Tech., Cambridge.
THERMAL REACTIONS OF AROMATICS WITH CaO Final Report
J. P. Longwell, D. L. Ellig, K. Lai, D. W. Mead, G. C. Williams, and W. A. Peters May 1985 49 p refs
(Contract DE-FG22-80PC-30229)
(DE85-010688; DOE/PC-30229/1827) Avail: NTIS HC A03/MF A01

The pyrolysis of benzene, toluene, 1 methylnaphthalene, 1 methylanthracene, 0 methylanthracene, m cresol, and n heptane was studied over CaO and quartz in a fixed bed reactor under atmosphere pressure. The reaction temperature spanned the range of 350 to 900(0)C with vapor phase residence time kept between 1 and 2 seconds. Compared to quartz, CaO significantly increased the rates and extents of pyrolysis of the aromatic hydrocarbons, reducing the temperature for a given amount of conversion by at least 100(0)C. The magnitude of this enhancement effect increased with increasing aromaticity, or molecular size, of the compounds. For the light aliphatic, n heptane, the effect of CaO is minor, with pyrolysis results similar to those observed over quartz and in vapor phase cracking. Coke was the major product for pyrolysis of aromatic compounds over either solid. Detailed examination of the distribution of the volatile products suggests that: (1) condensation reactions were the major pyrolysis reactions over CaO, and (2) some of the active sites on the CaO surface may be related to anion defects in the CaO lattice. DOE

N85-33194# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
OXIDATION OF FORMALDEHYDE SOLUTIONS USED FOR THE PRESERVATION OF REVERSE OSMOSIS MEMBRANES
W. J. Boegli, A. P. Murphy, and M. K. Price Dec. 1984 62 p
(PB85-185585; REC-ERC-84-8) Avail: NTIS HC A04/MF A01 CSCL 07A

The results of an experimental study of a new process for the catalytic oxidation, at ambient temperatures of dilute formaldehyde used in aqueous solutions for the preservation of cellulose acetate reverse osmosis membranes is presented. The oxidation involving hydrogen peroxide and an iron (ferric chloride) catalyst was first tested in a bench scale adiabatic reactor to develop operating curves for several concentrations of formaldehyde and to show the total oxidation time as a function of selected variables. The oxidation was found to be rate rather than mass diffusion controlled and, based on chemical similitude considerations, can be scaled up directly. Based on the results of the study, recommendations are made for the design and operation of a full scale reactor for the Yuma Desalting Plant. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N85-33195 National Physical Lab., Teddington (England). Div. of Materials Applications.
LONG-TERM STRENGTH OF GLASS FIBRE/PHENOLIC RESIN COMPOSITES
J. Aveston, W. J. Greenwood, and J. M. Sillwood Feb. 1985 17 p refs
(NPL-DMA(A)-98; ISSN-0143-7313) Copyright. Avail: Issuing Activity

Tensile stress rupture data for water immersed chopped strand mat and strands of glass fiber with a matrix of cold curing phenolic resin are presented. It is shown that these results are comparable with similarly reinforced specimens where the matrix is a polyester resin. Weight change experiments are used to indicate the water content in a sample of unreinforced resin at various stages in a temperature/humidity profile. Author (ESA)

N85-33196# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
TENSILE FATIGUE OF GLASS FIBERS AND COMPOSITES WITH CONVENTIONAL AND SURFACE COMPRESSED FIBERS
J. F. Mandell, F. J. McGarry, A. J.-Y. Hsieh, and C. G. Li Dec. 1984 30 p refs Sponsored by Corning Glass Works
(RR-R84-4) Avail: NTIS HC A03/MF A01

The mechanism of tensile cyclic fatigue failure in conventional glass fiber dominated composites was investigated using single fibers, stands, and composites. Surface damage to the fibers resulting from a fretting type of contact is identified as the dominant mechanism. Macrofibers of glass or glass-ceramic with residual surface compression were developed to overcome the sensitivity to cyclic and static fatigue. The macrofibers and their composites with several different matrices show greatly improved tensile fatigue resistance. E.A.K.

N85-33197# Societe Nationale Industrielle Aerospatiale, Saint-Medard-en-Jalles (France).
UTILIZATION OF MICROWAVE MEASURING SYSTEMS FOR THE AUTOMATION OF COMPOSITE MATERIALS MANUFACTURING [UTILISATION DE SYSTEMES DE MESURE MICRO-ONDE POUR L'AUTOMATISATION DES FABRICATIONS DE MATERIAUX COMPOSITES]

J. L. Miane and J. F. Lacombe 1985 10 p In FRENCH Presented at Journees Europeennes des Composites, Paris, 20-21 Mar. 1985
(SNIAS-851-430-102) Avail: NTIS HC A02/MF A01

The percentage of resin and its physical chemical characteristics were determined in Kevlar-glass and Kevlar-carbon composites using a resonant cavity implemented with a closed waveguide section. The frequency and power transmitted are measured to determine the permittivity. The impregnation rate of a continuous single fiber is determined by the variations of the power transmitted at a fixed frequency close to the resonant frequency. The measurement is successfully employed industrially. Author (ESA)

N85-33198# MATRA Service Aerodynamique, Le Chesnay (France).
FILAMENT WOUND STRUCTURES IN PSP CARBON COMPOSITE Final Report [STRUCTURES BOBINEES EN COMPOSITE CARBONE PSP]
R. Accolas Jul. 1984 46 p refs In FRENCH
(Contract DRET-81-34-234-00-470-75-01)
(RV10/84424) Avail: NTIS HC A03/MF A01

The behavior of PSP resins used in filament wound structures under thermal peak conditions is studied. The winding process starting from preimpregnated fibers was studied, and flat and cylindrical samples were obtained. Mechanical tests were carried out. The results show low winding quality and low result reproducibility. The behavior up to 600 C is good. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-33199 Defence Research Information Centre, Orpington (England).
DETERMINATION OF ORGANOBROMIDE COMPOUNDS IN WATER BY GAS CHROMATOGRAPHY-NEGATIVE ION CHEMICAL IONISATION MASS SPECTROMETRY
K. Koida, Y. Kohno, Y. Fukuda, K. Sekigawa, S. Yoshizaki, A. Oka, and M. Nakawama Feb. 1985 12 p refs Transl. into ENGLISH from Eisei Kagaku (Japan), vol. 29, no. 6, 1983 p 352-356
(DRIC-T-7411; BR94469) Copyright. Avail: NTIS HC A02/MF A01

Gas chromatography-negative ion chemical ionization mass spectrometry (GC-NCIMS) was evaluated as a method for qualitative and quantitative determination of organobromine compounds in water. The negative ion mass spectra of bromine-containing trihalomethanes (CH Br C 2, CH Br Cl and Ch Br 3) consisted of 2 peaks of m/z 79 and 81, corresponding to mass numbers of atomic bromide. The detection limit for these compounds is 1.0 ppb. The results show that organobromine compounds in water can be assayed by GC-NCIMS. Author (ESA)

N85-33200 Defence Research Information Centre, Orpington (England).
ON THE RELATIONSHIP BETWEEN ELECTRONICS AND CHEMISTRY
Karl Hagenbuchner Mar. 1985 15 p refs Transl. into ENGLISH from Praxis der Naturwiss.: Chem. (West Germany), vol. 33, no. 6, 1984 p 170-173
(DRIC-T-7480; BR95295) Copyright. Avail: NTIS HC A02/MF A01

The role of chemistry in advances in electronics, and the possibilities created in chemistry by developments in microelectronics are discussed. Author (ESA)

N85-33201*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CRYOGENIC LASER CALORIMETRY FOR IMPURITY ANALYSIS Final Report, 6 Sep. 1983 - 1 Dec. 1984
Randall T. Swimm May 1985 17 p refs
(NASA-CR-176102; NAS 1.26:176102) Avail: NTIS HC A02/MF A01 CSCL 07B

The results of a one-year effort to determine the applicability of laser-calorimetric spectroscopy to the study of deep-level impurities in silicon are presented. Critical considerations for impurity analysis by laser-calorimetric spectroscopy are discussed, the design and performance of a cryogenic laser calorimeter is described, and measurements of background absorption in high-purity silicon are presented. Author

N85-33202# Department of Energy, Washington, D. C.
METHOD FOR FLUORINATION OF ACTINIDE FLUORIDES AND OXYFLUORIDES USING O2F2 Patent Application
P. G. Eller, J. G. Malm, and R. A. Penneman, inventors (to DOE) Filed 1 Aug. 1984 9 p Prepared in cooperation with LANL
(Contract W-7405-eng-36)
(DE85-011646; US-Patent-Appl-SN-636656) Avail: NTIS HC A02/MF A01

The present invention relates generally to methods of fluorination and more particularly to the use of O2F2 for the preparation of actinide hexafluorides, and for the extraction of deposited actinides and fluorides and oxyfluorides from reaction vessels. The experiments described demonstrate that the room temperature or below use of O2F2 will be highly beneficial for the preparation of pure actinide hexafluorides from their respective tetrafluorides without traces of HF being present as occurs using other fluorinating agents. DOE

N85-33203# Sandia Labs., Albuquerque, N. Mex.
SANDIA COOPERATIVE GROUP ON THE AEROTHERMOCHEMISTRY OF TURBULENT COMBUSTION. DISCUSSION RECORD OF THE SECOND MEETING
S. C. Johnston Dec. 1984 52 p refs Meeting held in Ithaca, N.Y., 3-4 Oct. 1983
(Contract DE-AC04-76DP-00789)
(DE85-007493; SAND-84-8252; CONF-8310362-Summ) Avail: NTIS HC A04/MF A01

A turbulent reacting flow working group has been established through the Department of Energy/Office of Basic Energy Sciences. The purpose of this group is to establish and maintain a strong interaction and active dialogue between workers currently involved in modeling turbulent reacting flows and those involved in related experiments. One objective of this collaboration is to develop an increased understanding of the fundamental interaction between the chemical and fluid dynamical processes occurring in chemical-reacting flows, and to utilize this understanding to improve predictive capabilities for turbulent combustion. Regular members, who represent academia, private industry, and national laboratories, and guests participate in the meetings. Several guests are invited to each meeting to provide an influx of different ideas and opinions to the discussions. This document is a summary of the discussion that took place during the second meeting, which was held at Cornell University on October 3 to 4, 1983. For individual titles, see N85-33204 through N85-33212.

N85-33204# California Univ., San Diego. Dept. of Applied Mechanics and Engineering Sciences.
COMMENTS ON TWO MATTERS RELATED TO TURBULENT COMBUSTION
Paul A. Libby *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 9 (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Work on the extension of the Bray-Moss-Libby formalism for premixed turbulent combustion so as to include space- and time-scale information is continued. Significant progress was made. In particular, the general formulation for a two-point, two-time description of a premixed turbulent flame with thermochemistry

given by the Bray-Moss model has been developed and subsequently specialized to one-point, two-time statistics. This focuses on the autocorrelation of the progress variable which at a fixed spatial location is treated as a zero-one function of time. An equation is derived for the autocorrelation of the so-called assymmetric telegraph signal, i.e., one with a nonzero mean, for two separate distributions of the passage times, i.e., the durations of zero's and one's. The first involves exponential pdf's and is analytically considerably simpler than the second, a so-called gamma-2 distribution, which is more realistic in that experimental data suggest zero passages of zero duration. This analysis is of interest since it provides a new perspective on the utility of data obtained in premixed turbulent flames. Comment is also made on the proper treatment of the boundary conditions at the outer edge of turbulent shear layers when second-moment methods are used. Author

N85-33205# California Univ., Davis.
PRESSURE CORRELATIONS IN TURBULENT REACTING FLOWS **c34**
W. Kollmann *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 10-11 refs (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Correlations with pressure represent a major difficulty in closing moment of pdf equations in reacting and nonreacting turbulent flows. The pressure satisfies instantaneously a Poisson-type equation for constant density flows, which leads to integrals over two-point correlations. For variable density flows, the pressure satisfies a hyperbolic equation describing acoustic wave propagation and hydrodynamic pressure variation. The effect of the fluctuations of density on pressure and its correlations with other variables are investigated. Density in combusting flows can be considered a bounded variable and then is the maximal fluctuation given by a jump process in time and space. This limit case of a pure jump process is taken as approximation for large density fluctuations. For diffusion flames, a further decomposition into mixing and reacting contributions can be obtained. The mixing contribution is negligible whereas the reactive part can be represented for certain correlations of the pressure as integral over the reaction surface S = O. A formal solution for the correlation of the pressure gradient with another fluctuation can be obtained as Neumann series. For the general case, however, only a representation of the pressure correlations as a sum of velocity, mixing, reacting, boundary parts could be established. Author

N85-33206# Sandia Labs., Albuquerque, N. Mex.
SECOND ORDER MODELLING IN NON-CONSTANT DENSITY FLOWS
C.-Y. Chen and J. L. Lumley *In its* Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 12-23 ref (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Second order modelling of non-constant density flows using a formal expansion of the moment equations has been applied to calculate several thin shear flows including a constant-density heated jet, a methane jet, helium and CO2 jets, and a jet-like diffusion flame (H2-Air) with and without axial pressure gradients. The objective is to extent existing second order models for constant density flows to the variable density case in such a way that improvements in the constant density model are readily transposed to the variable density case. For the simple thin shear flows, the third moment terms are of small order compared to the production terms, the dissipation terms, and the pressure interaction terms. Hence using constant-density models for these terms would be appropriate to first order approximation. In modelling for constant-density lows, one can separate the pressure interaction terms into two major parts: (1) a transport term, and (2) a pressure straining term. The pressure transport term is of the same order as the third moment terms; hence, it does not pose new problems. Author

N85-33207# Sandia Labs., Albuquerque, N. Mex.
TURBULENT MIXING AND COMBUSTION
Paul E. Dimotakis *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 24-36 refs (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

A suggestion is made that higher order closure turbulence models be included in this study, a discussion of which follows: e.g., the Reynolds averaged hierarchy of equations describes at best an asymptotic procedure which may or may not be convergent. It is especially likely that it is not in the case of turbulent shear flow, where fluctuating terms can be as large or larger than mean quantities. Such procedures are often characterized by residual errors epsilon sub n, following the nth order term which display a minimum as a function of n. In other words, the asymptotic procedure including nth order terms can be a better approximation to the problem than one including terms of order (n+1); it may well be that second order closure schemes (modeling third order terms in the fluctuations) may be worse than first order closure schemes (modeling second order terms). The number of terms that have to be modeled, in a more or less ad hoc manner, rises very rapidly as closure order increases, rendering the whole procedure increasingly arbitrary and consequently even more suspect. Author

N85-33208# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
JET FLOWS: MODELLING AND EXPERIMENTS Abstract Only
M. C. Drake *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 37 (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

The interactions of turbulent fluid mixing and chemical kinetics have been studied using a closely coupled modeling and laser-based experimental approach. Two cases are discussed. The first case is a turbulent jet of CO/H2/N2 fuel with added NH3 to simulate fuel-bound nitrogen species. A model based upon time-averaged Navier-Stokes equations with kappa-epsilon turbulence closure and an assumed pdf equilibrium chemistry approach gave results in excellent agreement with the experimental data for mu, mj' and xi. The Favre variance of xi was not in good agreement and the calculated average values of temperature were as much as 200K higher than experimentally measured. Much of the temperature descrepancy may be due to finite rate chemistry effects involving CO. A simplified kinetic mechanism involving the production and destruction of NO from NH2 also predicted the experimentally observed trends in NO yield from added NH3 although the magnitude of the yield was overpredicted by a factor of approx. 2. The second case is a turbulent jet of H2 fuel. The assumption of equilibrium was tested by laser induced saturated fluorescence measurements of OH radical concentrations. The substantial superequilibrium OH concentrations observed are compared with a partial equilibrium thermodynamic calculation, and turbulent combustion models which predict superequilibrium either by perturbation techniques or two scalar joint pdf approaches. Author

N85-33209# Sandia Labs., Albuquerque, N. Mex.
SIMULTANEOUS MEASUREMENT OF VELOCITY AND DENSITY IN A TURBULENT NONPREMIXED FLAME
R. W. Schefer *In its* Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 38-44 (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Models for turbulent reacting flows utilize assumptions based on isothermal and nonreacting turbulent flows, but recent evidence indicates that these assumptions may not be valid in reacting flows. However, models which utilize conditional statistics for turbulent flows show considerable promise for use in reacting flows. Measurements of conditionally sampled turbulent and nonturbulent zone averaged quantities are necessary to the development of these approaches. The combined laser velocimetry-laser Rayleigh

scattering technique is well suited to measurements of this type since the measured gas density can be used to indicate the presence of turbulent and nonturbulent fluid. The difference between turbulent and nonturbulent zone averaged mean and fluctuating axial velocities are compared with results obtained in a nonreacting heated jet. In both cases the zone-averaged mean velocity difference decreases with decreasing intermittency gamma and the zone-averaged turbulence intensity difference increase with decreasing intermittency. Values for both the mean and fluctuating velocity differences are, however, 40 to 60 percent higher in the heated jet than in the reacting jet. Author

N85-33210# Sandia Labs., Albuquerque, N. Mex.
VORTEX DYNAMICS SIMULATION OF CONSERVED SCALAR DISSIPATION Abstract Only
William T. Ashurst *in its* Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 45 (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Under certain assumptions, turbulent diffusion flames may be described in terms of a conserved scalar (fast chemistry, mixing limited turbulence). A normalized fuel mass fraction provides such a scalar and the square of its gradient is known as the scalar dissipation. (It is fluctuations in the scalar value that are dissipated by molecular diffusion). There are two points of interest: (1) the time-average dissipation value determines the time-averaged chemical production, and (2) large dissipation values lead to flame quenching due to heat condition away from the flame zone. The two-dimensional vortex dynamics method has been used to create flow in which a passive scalar is convected and diffused. On a numerical mesh the scalar gradient and its probability density function (pdf) are calculated. Two flows have been studied at this time: (1) homogeneous flow with imposed scalar gradient, and (2) inhomogeneous flow with step change in scalar value at time zero. In the inhomogeneous flow, which represents a time developing mixing layer, we find that at the outer edge of the layer, the scalar gradient can be described in terms of one lognormal variable. In the homogeneous flow, which represents a section of the TDF flow, we find that the dissipation pdf obeys scaling laws in that the dissipation is lognormal and the lognormal parameters depend on cell size over which it is measured. Author

N85-33211# Sydney Univ. (Australia).
NONEQUILIBRIUM CHEMISTRY IN AN ISOTHERMAL TURBULENT FLOW c34
N. R. Mudford and R. W. Bilger *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 46-51 refs Original language document previously announced as A85-14371 Sponsored in part by Australian Research Grants Scheme (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

The mixing of two air streams doped respectively with NO and O3 in an isothermal turbulent flow and the resulting nonequilibrium chemical reaction have been studied using a recently developed turbulent smog chamber and relatively fast chemiluminescent analyzers. Joint probability-density functions of reactant concentration, mixture fraction, reaction-progress variable, reaction time, and mean reaction rares are presented and interpreted in the light of preliminary. Author

N85-33212# General Electric Co., Schenectady, N. Y. Corporate Research and Development.
MODELING OF TURBULENT RECIRCULATING COMBUSTING FLOWS
S. M. Correa *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 52-54 refs (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

Recirculating flows are fluid-mechanically and computationally more complex than shear flows. Consequently, they are not as appropriate for validating new turbulence-chemistry interaction models. On the other hand, they provide an interesting and practical application of models that have already been tested in shear flows. Here a standard model was applied to the Air Force Aero Propulsion Lab (AFAPL) axisymmetric bluff-body stabilized non-premixed flame. The cylindrical bluff-body has a narrow central fuel jet which stagnates or penetrates the recirculation zone depending on the jet velocity. The overall model is based on the averaged (density-weighted) Navier-Stokes equations, the kappa-epsilon turbulence model with isotopic eddy viscosity, and an equilibrium chemistry/assumed shape (beta-function) pdf for the mixture fraction (from the first two moments). Predictions agree qualitatively with the (LDV, thermocouple) data on gross features. Details are not well simulated, e.g., kinetic energy at the first free stagnation point (S1) is grossly underpredicted. The kappa-epsilon model is quite clearly inadequate. Author

N85-33213# Washington Univ., Seattle. Dept. of Physics.
X-RAY SPECTROSCOPY OF SOLIDS UNDER PRESSURE Annual Technical Progress Report, Aug. 1984 - Jul. 1985
R. L. Ingalls 4 Apr. 1985 9 p
(Contract DE-FG06-84ER-45163)
(DE85-011486; DOE/ER-45163/1) Avail: NTIS HC A02/MF A01

A program to investigate the X-ray absorption behavior of materials subjected to high pressures was continued. Of particular interest was the extended X-ray absorption fine structure and the X-ray absorption near edge structure. Materials generally studied are alkali halides, zinc-blende-type semiconductors and, more recently, mixed-valent materials and compressed copper. DOE

N85-33214# Ames Lab., Iowa.
AMES LABORATORY MEASUREMENTS OF ALKALI LEVELS IN THE CURTISS-WRIGHT PFBC GAS STREAM
W. J. Haas, Jr. and D. E. Eckels Jan. 1985 38 p
(Contract W-7405-eng-82)
(DE85-011357; IS-4870) Avail: NTIS HC A03/MF A01

Application of the Ames Laboratory alkali monitor to the determination of total sodium and total potassium concentration levels in hot gas exhaust streams from the pressurized fluid bed combustion of coal is described. The hot gas streams were from the Department of Energy pressurized fluid bed combustor facility located at the Curtiss-Wright Corporation, Wood-Ridge, New Jersey. The analytical results and the log of significant events associated with the operation of the combustor and alkali monitor are reported in tabular and graphical form. DOE

N85-33215# North Dakota Univ., Grand Forks. Energy Research Center.
SIZE EXCLUSION CHROMATOGRAPHY-LOW ANGLE LASER LIGHT SCATTERING PHOTOMETRY OF LIGNITE MACROMOLECULES
E. S. Olson and J. W. Diehl 1985 24 p Presented at the 21st Intern. Symp. on Chromatography, Oslo, 3 Jun. 1985
(Contract DE-FC21-83FE-60181)
(DE85-012017; DOE/FE-60181/80; CONF-8506116-1) Avail: NTIS HC A02/MF A01

The determination of molecular weight distribution in humic acids derived from lignite was successfully carried out by the application of size exclusion chromatography coupled with low angle laser light scattering photometry. Reduction of soluble derivatives with zinc in acetic anhydride-dimethylformamide was required to reduce the absorbance so that linear scattering response was obtained. A benzyl derivative and a methyl derivative exhibited the best chromatographic results, giving weight average molecular weights of about one-half million. DOE

N85-33216# Argonne National Lab., Ill.
RECENT ADVANCES IN d-c RELAXATION TECHNIQUES FOR THE MEASUREMENT OF KINETICS OF FAST ELECTRODE REACTIONS
Z. Nagy Nov. 1984 11 p Presented at the 167th Electrochem. Soc. Meeting, Toronto, 12 May 1985
(Contract W-31-109-eng-38)
(DE85-005029; CONF-850542-2) Avail: NTIS HC A02/MF A01

Recent advances in the d-c relaxation techniques have extended the range of applicability of these techniques to reactions

one to three orders of magnitude faster than hitherto measurable. Some of this improvement is due to better instrumentation; however, the major part came from the use of computerized data evaluation. This data-evaluation method has several advantages over the graphical data-evaluation methods commonly used in the past. These advantages are presented with special reference to the measurement of kinetics of reactions in high-temperature molten salts. Galvanostatic techniques (single and double pulse), coulostatic techniques (charge impulse and current impulse), and potentiostatic techniques (single and double pulse) are discussed in detail, and their relative merits are described. In addition, different methods are discussed for the determination of the reliability of the results. The best method was found to be a statistical analysis coupled to computer curve-fitting data evaluation. DOE

N85-33217# Wheelabrator-Frye, Inc., Pittsburgh, Pa. Air Pollution Control Div.

EVALUATION OF PILOT ESP USED WITH A SPRAY DRYER FGD SYSTEM AT PITTSBURGH ENERGY TECHNOLOGY CENTER, BRUCETON, PENNSYLVANIA Technical Report, Sep. 1983 - May 1984

J. D. Sherow and D. M. Tulenko 1985 35 p
(Contract DE-FC22-83PC-61503)
(DE85-011151; DOE/PC-61503/1-Vol-1) Avail: NTIS HC A03/MF A01

Testing was done to evaluate the performance of an ESP with a rotary atomizer spray dryer installed upstream of the ESP. Three Eastern coals, two medium sulfur and one low sulfur, were fired in a 500 lb/h boiler. The ESP performance was measured without the spray dryer in operation, with the spray operation at 70, 80 and 90% SO2 removal efficiencies and with 80% SO2 removal efficiency using recycled spray dried ash from the ESP and fresh slurry. The ESP was operated with constant gas volume, collecting area and power input to minimize the variations in test results. It was found that an ESP can be used to collect scrubbed gas and flyash, and the conveyance of the spray dried product and flyash is not a problem. The test results show that both inlet and outlet particulate loadings increase with varying spray dryer slurry rates and the ESP efficiency remains about the same. The Coal ESP efficiency increased several tenths of a percent with the spray dryer in operation while Coal 2 and 3 efficiencies dropped several tenths of a percent. The increase or decrease in efficiency depends upon the flyash and flue gas chemistry. DOE

N85-33218# Sandia Labs., Albuquerque, N. Mex.

IONIZATION DETECTION OF STIMULATED RAMAN SPECTRA

P. Esherick and A. Owyoung 1985 6 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010672; SAND-84-2061; CONF-850345-23) Avail: NTIS HC A02/MF A01

Ionization-detected stimulated-Raman spectroscopy (IDSRS) is a new technique for high-sensitivity, high-resolution Raman studies. The technique is based on resonant laser ionization detection of vibrationally-excited molecules produced via simulated Raman pumping. The sensitivity of IDSRS relative to stimulated Raman gain spectroscopy is illustrated. Spectra taken of the diatomic molecule NO are compared using each technique. More recent results on the application of IDSRS to a considerably larger molecule are presented. These spectra, taken near 1600/cm, cover the region where the nu16 fundamental and nu2+nu18 combination band of benzene overlap to produce a particularly complex appearing spectrum. DOE

N85-33219# Los Alamos National Lab., N. Mex.

PHOTOFRAGMENT FLUORESCENCE AS A SENSITIVE PROBE FOR GAS-PHASE ALKALI COMPOUNDS AND THEIR PHOTOCHEMISTRY

R. C. Oldenborg, S. L. Baughcum, D. Hof, and K. E. Winn 1985 18 p refs Presented at the Southwest Conf. on Opt., Albuquerque, N. Mex., 4 Mar. 1985
(Contract W-7405-eng-36)
(DE85-010707; LA-UR-85-1278; CONF-850345-21) Avail: NTIS HC A02/MF A01

Sensitive techniques are needed for the detection of highly corrosive gas-phase alkali compounds in coal gasifier gas turbine streams. The use of photofragment fluorescence as a very sensitive, selective probe for alkali compounds is discussed. Photodissociation of a gas-phase alkali compound using a laser at suitably short ultraviolet (UV) wavelengths produces an electronically excited alkali atom. Detection of fluorescence from these excited atoms allows sensitive and quantitative density measurements of a compound while signal strength as a function of dissociation laser wavelength allows differentiation of compounds. Presented here is an evaluation of this approach based on the results of experiments to study the photodissociation of the alkali compound KCl. The KCl vapor was contained in a quartz cell and irradiated at 193 nm with an ArF laser and at other Raman-generated wavelengths. Emission at 766 nm was observed from atomic potassium (4(2)P) produced in the photodissociation process. The spectral dependence for the production of excited potassium atoms is distinct enough that discrimination from other compounds, such as KOH, appears likely. The atomic emission intensity quantitatively tracks the KCl density over at least 5 orders-of-magnitude. As little as 4 x 10(7) KCl molecules/cc, or a 0.4 part-per-billion KCl concentration, can be measured on a single laser shot. DOE

N85-33220# Los Alamos National Lab., N. Mex.

STATIC HIGH PRESSURE STUDY OF NITRIC OXIDE CHEMISTRY: PROPOSED MECHANISM FOR NITRIC OXIDE DETONATION

B. I. Swanson, S. F. Agnew, and N. R. Greiner 1985 10 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract W-7405-eng-36)
(DE85-010795; LA-UR-85-1176; CONF-850706-16) Avail: NTIS HC A02/MF A01

The chemistry of nitric oxide under static high pressure conditions has been studied using diamond anvil cells and spectroscopic methods. Pressurized samples warmed rapidly to room temperature undergo facile disproportionation to form N2O, N2O3, N2O4, and NO(+) NO3(-). Nitric oxide maintained at 80 K is observed to react at ca 2.5 GPa to form, dominantly, N2, O2, and NO(+) NO3(-). The complex chemistry of nitric oxide is best explained in terms of two competing primary reaction mechanisms involving the direct formation of N2 and O2, and disproportionation to form N2O and NO(+) NO3(-). The disproportionation reaction, which is favored under higher temperature conditions, releases two-thirds of the total energy content, and is believed to be important in the early chemistry accompanying shock-initiation of nitric oxide. Laboratory scale detonation studies, where the gaseous products are analyzed spectroscopically, show evidence for, dominantly, disproportionation and a small amount of N2/O2 production. This study points to the importance of condensed phase concented reactions as well as ions and ionic reaction mechanisms in the shock initiated detonation of HE's. DOE

N85-33221# Brigham Young Univ., Provo, Utah. Dept. of Chemistry.

SUPERCRITICAL FLUID CHROMATOGRAPHY/SUPERSONIC JET SPECTROSCOPY Progress Report, 1 Nov. 1984 - 31 Jan. 1985

M. L. Lee and S. R. Goates Feb. 1985 12 p
(Contract DE-FG22-83PC-60807)
(DE85-007005; DOE/PC-60807/6) Avail: NTIS HC A02/MF A01

The UV chromatogram of the supercritical fluid fraction (SFF) of a catalytically cracked petroleum bottoms sample and the gas chromatograms of the three fractions collected during the SFE demonstrate the capability of the SFF system to fractionate highly alkylated materials and 6 ring polycyclic aromatic hydrocarbons. The sulfur fraction of the catalytically cracked petroleum bottoms was also successfully fractionated. In addition, during this period, standard compounds were used to study the effect of mobile phase density on resolution of closely related compounds. It was found that, in general, the resolution of a pair of closely related

isomers could be improved by as much as 100% by decreasing the mobile phase pressure at constant temperature on a given column. However, it was also concluded that the particle size of the packing in the column has a large effect on resolution as well. Initial supersonic jet spectroscopic results indicate that the distribution of the samples in the jet is relatively narrow. It will be important to more carefully map the sample distribution in order to maximize sample excitation and thus sensitivity of detection.
DOE

N85-33222# Institut de Mecanique des Fluides de Toulouse (France).
STUDY OF MOLECULAR DIFFUSIVITY INFLUENCE ON MASS TRANSFER RATE AT A WATER-ATMOSPHERE INTERFACE
A. Baleix, B. Caussade, J. George, J. Mathieu, A. Reynes, and L. Torres 1983 12 p refs Presented at 4th Intern. Congr. Chim. et Protection de l'Environnement, Toulouse, 19-25 Sep. 1983
Avail: NTIS HC A02/MF A01

A solid-gas chromatography method was used to study interfacial mass transfer (KL) at a water-atmosphere interface. It was possible to measure concentrations of helium down a few tens of parts per billion with good reproducibility when in situ sampling and injecting problems were overcome. Results confirm direct dependance of KL on the waves and on the interfacial shear stress, and show that KL increases with gas diffusivity, decreasing when the Schmidt number increases. Author (ESA)

N85-33223# Institut Franco-Allemand de Recherches, St. Louis (France).
COMBUSTION-DEFLAGRATION-DETONATION TRANSITION IN A CONFINED SPHERICAL POWDER [TRANSITION COMBUSTION-DEFLAGRATION-DETONATION DANS UNE POUDRE SPHERIQUE CONFINEE]
M. Samirant and A. Lichtenberger 15 May 1984 31 p refs In FRENCH
(Contract DRET-81/529)
(ISL-R-108/84) Avail: NTIS HC A03/MF A01

The propagation of compression waves ahead of the combustion front, the compactation of the porous powder media and the resulting shearing are studied for RDX wax powder. A strong steel tube, 16 mm in diameter, was used. Ionization gages inside the tube and shock wave meters outside were installed. The validity of a mathematical model for the propagation of the combustion wave and a second model for the continuous transition in the spherical powder are demonstrated. Author (ESA)

N85-33224# Institut Franco-Allemand de Recherches, St. Louis (France).
BEHAVIOR OF THE POROUS BED IN A COMBUSTION-DEFLAGRATION-DETONATION TRANSITION
M. Samirant and A. Lichtenberger 10 Sep. 1984 16 p ref Presented at DEA-AF-71-F/G-7304 Phys. of Explosives Conf., Albuquerque, N. Mex., 17-19 Oct. 1984
(Contract DRET-81-529)
(ISL-CO-220/84) Avail: NTIS HC A02/MF A01

The combustion-deflagration-detonation transition occurring in a heavily confined porous medium of explosives and propellants was studied. Transition modes in RDX wax and ball powder are described. If combustion wave energy is used to compress elastically the porous bed, a stable structure establishes, the combustion wave runs into a deflagration with constant velocity, and the transition does not occur. If the compression energy goes to heating the medium by mechanical deformation the volume of reacting matter increases, the combustion accelerates and the phenomenon runs gradually into detonation. The first model is applicable to RDX-wax behavior which shows the deflagration phase to occur at constant velocity. Transition needs a shock wave coming from the rear. The second model applies to ball powder in which the pronounced deformation causes the medium to heat-up. This results in an accelerated combustion and a smooth transition to detonation. Author (ESA)

N85-33225# Institut Franco-Allemand de Recherches, St. Louis (France).
COMBUSTION-DEFLAGRATION-DETONATION TRANSITION [TRANSITION COMBUSTION-DEFLAGRATION-DETONATION]
M. Samirant 3 Sep. 1984 12 p ref In FRENCH Presented at Journees Paul Vieille, Le Bouchet, France, 26-27 Sep. 1984
(Contract DRET-81-529)
(ISL-CO-221/84) Avail: NTIS HC A02/MF A01

Two modes of transition in porous reactive materials strongly confined are identified. In the case of RDX wax the final phase is a fast transition shock-detonation. It is shown that a porous bed behaves differently than normal spherical powder under the stress produced by the compression wave caused by the combustion front. Author (ESA)

N85-33226# Institut Franco-Allemand de Recherches, St. Louis (France).
GAS COMPOSITION AND MOLECULE VELOCITY IN THE DETONATION PRODUCTS OF PENTAERYTHRITOL TETRANITRATE (PETN) IN EXPANSION IN A HIGH VACUUM CONTAINER. ANALYSIS BY MASS SPECTROSCOPY AND TIME OF FLIGHT SPECTROMETRY [GASZUSAMMENSETZUNG UND MOLEKUELGESCHWINDIGKEITEN IN EXPANDIERENDEN DETONATIONSSCHWADEN VON NITROPENTA (PETN) IM HOCHVAKUUM. MASSENSPEKTROMETRISCHE UNTERSUCHUNG UND LAUFZEITANALYSE]
A. Hoeh 30 May 1985 52 p refs In GERMAN Presented at Fruehjahrstagung der Deut. Physik. Ges., Kiel, 20-23 Mar. 1984
(ISL-R-109/84) Avail: NTIS HC A04/MF A01

The gases produced by the detonation of PETN were analyzed by a quadrupole mass filter in a molecular beam system after free adiabatic expansion in a high vacuum container. From the intensity and the time of flight the mass dependent velocity distributions were determined; they agree well with a model of a uniformly moving gaseous source whose molecules have a Maxwellian velocity distribution. The heaviest molecules (H2O, CO, H2, NO, and CO2) pass local equilibrium state with a solidification temperature of 5300 K; H2 does not follow this normal distribution. Hydrogen molecules form the front of the detonation products with velocities up to 20 km/sec. The highest measured velocities of the molecules can be described with a unit formula. The composition of the detonation products in expansion differs from that of the received and cooled gases essentially by the NO content. In both cases the characteristics of an incomplete oxidation are found, indicating an unfavorable evolution of the reaction from the energetic point of view. The heavy CO2 molecules are an important contribution in the mechanical effect of expanding gases on rigid obstacles. Author (ESA)

N85-33227# National Bureau of Standards, Boulder, Colo. Chemical Engineering Science Div.
THERMOPHYSICAL PROPERTIES OF FLUIDS FOR THE GAS INDUSTRY Annual Report, Jan. - Dec. 1984
H. J. M. Hanley 22 Apr. 1985 201 p refs Sponsored by Gas Research Inst.
(PB85-198471; GRI-85/0027) Avail: NTIS HC A10/MF A01 CSCL 21D

Work carried out in the Fluid Properties Group, National Bureau of Standards, Boulder, is discussed. Results obtained in the calendar year 1984 are outlined. The most important are: viscosity data for gaseous and liquid CO2; fugacity data on H2 mixtures; and theoretical studies on mixing rules and local composition. The overall philosophy and technical resources of the group are discussed. Plans for the future are noted. Author (GRA)

N85-33228# Pennsylvania Univ., Philadelphia. Dept. of Physics.
EXPERIMENTAL STUDIES OF THE GEOMETRIC AND ELECTRONIC STRUCTURE OF CHEMISORPTION BONDING Annual Report, Jan. - Dec. 1984
E. W. Plummer and T. Gustafsson Mar. 1985 19 p refs Sponsored by Gas Research Inst.
(PB85-192250; GRI-82/0041) Avail: NTIS HC A02/MF A01 CSCL 07D

The chemisorption of small molecules on carefully prepared alloy surfaces has been studied using angle-intergrated and angle-resolved photoelectron spectroscopy, as well as with more conventional surface techniques such as thermal desorption, low energy electron diffraction and work function change. The authors have studied the (110) face of the alloy NiAl since it is the lowest index face with equal concentration of Ni and Al atom. Simply stated the objective is to separate or correlate the electronic and geometric factors governing chemisorption on bimetallic systems as a first step towards understanding the selectivity of multi-component catalysts. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-33229 National Physical Lab., Teddington (England). Div. of Materials Applications.
THERMODYNAMIC PROPERTIES OF ALLOYS IN THE Fe-Ti SYSTEM
A. T. Dinsdale, T. G. Chart, and F. H. Putland Jan. 1985 33 p refs
(NPL-DMA(A)-96) Copyright. Avail: Issuing Activity

Enthalpies of formation for five alloy compositions in the Fe-Ti system were measured using an adiabatic calorimeter. Based upon these, other measurements of the thermodynamic properties, and the accepted phase diagram for this system, a critical assessment was carried out to provide a set of data to represent these thermodynamic properties as a function of temperature and composition. The assessed data can be used in the calculation of multicomponent phase diagrams. Author (ESA)

N85-33230# Pacific Northwest Lab., Richland, Wash.
LONG-TERM RESEARCH IN JAPAN: AMORPHOUS METALS, METAL OXIDE VARISTORS, HIGH-POWER SEMICONDUCTORS AND SUPERCONDUCTING GENERATORS
G. J. Hane, M. Yorozu, T. Sogabe, and S. Suzuki Apr. 1985 63 p
(Contract DE-AC06-76RL-01830)
(DE85-010827; PNL-5376) Avail: NTIS HC A04/MF A01

The review revealed that significant activity is under way in the research of amorphous metals, but that little fundamental work is being pursued on metal oxide varistors and high power semiconductors. Also, the investigation of long term research program plans for superconducting generators reveals that activity is at a low level, pending the recommendations of a study currently being conducted through Japan's Central Electric Power Council. DOE

N85-33231# Connecticut Univ., Storrs. Dept. of Metallurgy.
FATIGUE BEHAVIOR OF CHROMIUM-CONTAINING FERRITIC STEELS AT ELEVATED TEMPERATURE Final Technical Report, 1 Jul. 1982 - 30 Jun. 1984
A. J. McEvily and J. Bunch 29 Apr. 1985 34 p refs
(Contract DE-AC05-84OR-21400)
(DE85-012309; UC/MET-22278-01) Avail: NTIS HC A03/MF A01

The interactive effects of creep, fatigue, and environment in a series of ferritic steels containing various amounts of chromium and molybdenum was studied. The particular alloys investigated were 2-1/4 Cr-1Mo, Mod 9Cr-1Mo, 9Cr-2Mo, 12Cr-1Mo, and 12Cr-2Mo alloys. The test program included creep testing, cyclic creep studies, and low cycle fatigue tests in air and in vacuum at elevated temperature. The creep lifetime was taken as the baseline and the effect of periodic off-loading on creep behavior was explored. This had led to an assessment of fatigue behavior at elevated temperatures under R = 0 loading conditions rather than the traditional R = -1 loading. The stability of the alloys in terms of microstructure was investigated for a number of test conditions. A short review of low cycle fatigue studies which have been performed on these alloys is presented to provide a background to the current work on cyclic creep studies. Following this background is a discussion of the results and observations stemming from this study. DOE

N85-33232# Los Alamos Scientific Lab., N. Mex.
RAPID ANALYSIS OF STEELS USING LASER-BASED TECHNIQUES
D. A. Cremers, F. I. Archuleta, and H. C. Dilworth (Armco Steel Corp., Middletown, Ohio) 1985 13 p Presented at 5th Process Technol. Conf. on Meas. and Control Instrumentation in the Iron Steel Ind., Detroit, 14 Apr. 1985 Submitted for publication
(Contract W-7405-eng-36)
(DE85-010747; LA-UR-85-1398; CONF-8504118-1) Avail: NTIS HC A02/MF A01

Based on the data obtained, it was concluded that laser-based techniques can be used to provide at least semi-quantitative information about the elemental composition of molten steel. Of the two techniques investigated here, the Sample-Only method appears preferable to the laser-induced breakdown spectroscopy (LIBS) method because of its superior analytical performance. In addition, the Sample-Only method would probably be easier to incorporate into a steel plant environment. However, before either technique can be applied to steel monitoring, additional research is needed. DOE

N85-33233# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS OF RESIDUAL STRESSES AND DISTORTION ON THE NICKEL 200 AND STAINLESS STEEL 304 WELDMENTS
A. J. Sunwoo and K. W. Mahin 26 Sep. 1984 56 p
(Contract W-7405-eng-48)
(DE85-011868; UCID-20250) Avail: NTIS HC A04/MF A01

Autogenous bead-on-plate welds made on nickel 200 and stainless steel 304 (SST) using the gas tungsten arc welding process. The transient thermal responses and displacement were monitored during welding using spot-welded thermocouples and linear voltage displacement transducers (LVDT). Variations in the parameters included plate thickness, current, heat input, travel speed, and restraint conditions. Electrode geometry and shielding gas were kept constant. Residual stresses were measured after welding using the blind-hole drilling technique. Comparison were then made between the fusion zone geometry as determined metallographically, and the resultant residual stress and distortion distributions. Results of the thermal responsese indicated that the two materials differ significantly in peak temperatures and cooling rates, which could be attributed to the differences in their thermal properties. Due to its lower thermal conductivity, the SST maintained heat in a smaller localized region, resulting in steeper thermal gradients and greater tendency to buckle than did nickel. On cooling, these gradients produced higher thermal stresses, which were responsible for the formation of residual compressive stresses in the heat-affected zone (HAZ). DOE

N85-33234# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
CENTRIFUGAL CASTINGS OF STAINLESS STEEL SPIKED WITH RADIOACTIVE TRACERS
J. M. Beeston and M. M. Larsen Mar. 1985 42 p refs
(Contract DE-AC07-76ID-01570)
(DE85-012003; EGG-WM-6835) Avail: NTIS HC A03/MF A01

The results of making centrifugal castings of stainless steel spiked with radioactive tracers are presented. After casting, the cylinders were machined and analyses made of the tracer content of the machining chips. The structure of the castings was also investigated for porosity and corrosion resistance. The tests have demonstrated that centrifugal castings can be made from a stainless steel supply contaminated with isotopes of cobalt, strontium, cesium, and iridium. With radiation levels of about 0.4 mR/h (which approaches the Defense Waste Processing Facility upper limit), no smearable surface contamination was obtained from the machined cylinders. For 60 to 67 (MU)Ci of radioactive isotopes melted with 500 lbs of steel, the contact activity

of the ingots was about 0.8 mR/h and the machined cylinders 0.4 mR/h. Most of the original (192)Ir and all the (60)Co activity was found distributed in the ingots and in the centrifugally cast cylinders. The (60)Co was homogeneously distributed and the iridium showed a slight migration due to the centrifugal force field of 120 G's. Porosity and corrosion resistance measurements showed an acceptable structure. DOE

N85-33235# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
TRITIUM-HELIUM EFFECTS IN METALS
G. R. Caskey, Jr. 1985 20 p refs Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract DE-AC09-76SR-00001)
(DE85-011507; DP-MS-84-129; CONF-850405-8) Avail: NTIS HC A02/MF A01

Investigations of helium effects in metals at the Savannah River Laboratory were carried out by introducing helium by radioactive decay of tritium. This process does not create concurrent radiation damage, such as accompanies ion implantation and (n,(ALPHA)) reactions. The process has its own peculiarities, however, which partially mask and interact with the helium effect of interest. The distribution and local concentration of helium and tritium, which are responsible for changes in mechanical properties and fracture mode, are controlled by the large difference in solubility and diffusivity between the two atoms and by their differing interaction energies with lattice defects, impurites, and internal boundaries. Furthermore, in all investigations with helium generated from tritium decay, some tritium and deuterium are always present. Consequently, property changes include tritium-helium interaction effects to some extent. Results of investigations with several austenitic stainless steels, Armco iron, and niboium single crystals illustrate the variety of phenomena and some of the complex interactions that can be encountered. DOE

N85-33236# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
VERY LOW TEMPERATURE STUDIES OF HYPERFINE EFFECTS IN METALS Progress Report
W. Weyhmann 1985 10 p
(Contract DE-FG02-84ER-45142)
(DE85-013367; DOE/ER-45142/1) Avail: NTIS HC A02/MF A01

Nuclei are used through the hyperfine coupling as a probe of magnetic interactions in metallic systems, emphasizing the role conduction electrons play. Three types of systems are of interest: nuclear singlet ground state intermetallic compounds, very dilute magnetic impurities in non-magnetic metals, and itinerant ferromagnets. The nuclear ordering in singlet ground state alloys of praseodymium appears to be analogous to electronic ordering in rare earth metals. The static and dynamic properties of these materials are measured both to study rare earth ordering, and to develop the sub-millikelvin refrigeration capabilities of these materials. Using this cooling power, it is proposed to study the local moment of Mn based Kondo systems at millikelvin and sub-millikelvin temperatures. Kondo systems with a Kondo temperature below 0.1 K have the advantage that magnetic saturation can be achieved with available magnets. It is also proposed to study both the local magnetization as measured with nuclear orientation and the macroscopic magnetization measured with SQUID magnetometry. A search for electron polarization effects in itinerant ferromagnets using nuclear orientation will be made. Induced hyperfine fields of less than 1 kOe can be detected at 1 mK. DOE

N85-33237# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif.
NEW AND REVISED METHODS OF PURIFYING MERCURIC IODIDE
N. Skinner and E. E. Wedum 1985 21 p refs Presented at the Am. Assoc. of Crystal Growth Workshop on Purification of Mater. for Crystal Growth and Glass Process., Watsonville, Calif., 14 May 1985
(Contract DE-AC08-83NV-10282)
(DE85-011684; EGG-10282-2054; CONF-8505142-1) Avail: NTIS HC A02/MF A01

Large single crystals of mercuric iodide are grown by the vapor transport method to provide materials for fabrication of efficient X-ray and gamma ray detectors. Commercially available high-purity mercuric iodide power must be further purified before it can be used as starting material for the crystal growth process. The standard purification procedures that were developed are reviewed, and two methods used in conjunction with this procedure are described. Results are discussed in terms of impurity analyses and detector performance. Sources of mercuric iodide and experiments in progress are outlined. DOE

N85-33238# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Structures and Materials Panel.
MANAGEMENT OF CORROSION
Loughton, England May 1985 168 p refs Lectures held in Ankara, 17-18 Jun. 1985, in London, 20-21 Jun. 1985, and in Ottawa, 2-3 Jul. 1985
(AGARD-LS-141; ISBN-92-835-1500-5) Avail: NTIS HC A08/MF A01

Papers submitted for AGARD Lecture Series No. 141 (Management of Corrosion), concerning the management of corrosion in the aerospace field, are presented. Among the subjects covered are the superiority of corrosion resistance of low alloy steel containing 0.5 wt% copper over plain carbon steel, some theoretical aspects of corrosion and practical implications for aircraft, the effect of the microenvironment on corrosion, corrosion protection by means of various coatings, the special susceptibility of aircraft components to corrosion, aircraft corrosion preventive measures, experimental methods used to monitor corrosion, and the effect of road salt and a marine environment on thin-gage metals used in vehicle and aircraft manufacture. For individual titles, see N85-33239 through N85-33247.

N85-33239# Michigan State Univ., East Lansing. Dept. of Metallurgy, Mechanics and Materials Science.
CORROSION MANAGEMENT STRATEGIES FOR AIRCRAFT AND RELATED SYSTEMS
Robert Summitt *In* AGARD Management of Corrosion May 1985 3 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

Unlike the automobile, which is considered a throwaway item in the U.S. economy, in the case of the aircraft, demands for safety and reliability, coupled with enormous replacement costs, force an anitcorrosion strategy which centers on timely and effective maintenance, regardless of cost. The operational life of an aircraft is greatly prolonged by a complex hierarchy of inspection and repairs, the costs of which never could be justified for a truck or automobile. Even more important than economics in aircraft, is the requirement for safety and reliability. The emphasis in aircraft anticorrosion tactics now lie in the fields of linear elastic fracture mechanics, damage-tolerant design, and reliability-centered maintenance. F.M.R.

N85-33240# Technische Hogeschool, Delft (Netherlands). Metallurgy Lab.
THEORETICAL ASPECTS OF CORROSION AND PRACTICAL IMPLICATIONS FOR AIRCRAFT AND RELATED SYSTEMS
W. A. Schultze *In* AGARD Management of Corrosion May 1985 24 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

The basic phenomena of corrosion, the nature of the operational environment, and the response of typical aerospace materials to corrosion are reviewed. Among the topics discussed are single electrode reactions, the dynamic equilibrium of an electrode reaction, the redox electrode, electrode potential, polarization, and reaction rates. Also discussed are corrosion reactions, i.e., corrosion of a homogeneous metal in an acid solution, Pourbaix diagrams, kinetic aspects of corrosion, the effect on corrosion of inhomogeneities in metal or environment, and the corrosion kinetics of a passive metal. F.M.R.

N85-33241# Sereda (P. J.), Ottawa (Ontario).
ENVIRONMENTAL FACTORS IN CORROSION AND DETERIORATION OF MATERIALS
P. J. Sereda *In* AGARD Management of Corrosion May 1985 11 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

The state-of-the-art in monitoring techniques and the importance of temperature, moisture (precipitation and relative humidity), solar radiation, and pollution as factors related to the microenvironment assisting in corrosion are reviewed. The effect of this microenvironment on the specific processes of corrosion and deterioration, and this on the performance of materials, is examined. Methods of monitoring the environment are reviewed, especially in connection with measurement of time-of-wetness, UV radiation, and pollution by sulfur dioxide. Areas where information is lacking, i.e., the effects of some pollutants (including acid rain), are identified. Author

N85-33242# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.
RATIONALE IN THE SELECTION OF CORROSION PROTECTIVE COATING SYSTEMS
Henry Leidheiser, Jr. *In* AGARD Management of Corrosion May 1985 17 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

Corrosion protection by coatings is a growing area of science and technology. This method of protection permits the design of a substrate with the desired physical and mechanical properties resistant to the environment to which the part is to be exposed. Protective coatings largely used at temperatures below 200C will be emphasized. Coatings are broken down for convenience into four types: metallic, polymeric, conversion, and comentitious. Each is discussed separately since the principles governing the performance of each type are different. Author

N85-33243# Middle East Technical Univ., Ankara (Turkey).
MAINTENANCE AND THE MILITARY ENVIRONMENT
Mustafa Doruk and Ayhan Tuefekcioglu (Turkish Air Force Supply and Maintenance Center, Eskisehir) *In* AGARD Management of Corrosion May 1985 21 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

Corrosion and maintenance problems are discussed from a military point of view. The general characteristics of aircraft corrosion and the environment to which military aircraft are exposed with typical examples of type and location of corrosion are given. Corrosion damage is evaluated in terms of dominant environmental factors. Consideration is also given to the role of alloys, heat treatment of metals, and design in corrosion prevention. Elements of a corrosion prevention maintenance program are briefly described with special emphasis on nondestructive inspection (NDI) methods of corrosion detection. Author

N85-33244# Royal Aircraft Establishment, Farnborough (England). Materials and Structures Dept.
CURRENT REQUIREMENTS FOR THE DESIGN AND MAINTENANCE AGAINST CORROSION OF UK MILITARY AIRCRAFT
C. J. E. Smith *In* AGARD Management of Corrosion May 1985 13 p (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

The protection of new aircraft against corrosion depends initially on the careful selection of materials, good design, and well applied protective schemes. The corrosion control measures which must be applied to UK military aircraft are given in Defence Standard 00-970 Chaper 801, Precautions against Corrosion and Deterioration, and the philosophy behind these measures is outlined. Regular corrosion maintenance is essential to ensure the continued operation of the aircraft once in service. The use and scheduling of maintenance procedures such as aircraft washing, the application of corrosion preventative compounds and the rectification of corrosion damage is discussed. Author

N85-33245# Naval Air Development Center, Warminster, Pa.
PROTECTIVE SYSTEMS AND MAINTENANCE POLICIES FOR MARINE ENVIRONMENTS
Irving S. Shaffer and C. T. Lynch (ONR, Arlington, Va.) *In* AGARD Management of Corrosion May 1985 13 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

The degradation of U.S. Navy systems performance is related to humidity and pollutants characteristic of the environment in which they operate. Several studies have correlated corrosion damage with these environmental factors. Moreover, experimental methods have been developed and used to monitor corrosion and to supplement environmental severity rating methods. The results of these studies and others provide a basis for development programs for alloys, protective coatings and corrosion inhibitors. This paper reviews current maintenance strategies - procedures, materials, and techniques - used by fleet personnel to minimize life-cycle costs of aircraft systems in an especially severe corrosive environment. Author

N85-33246# General Motors Corp., Warren, Mich.
LAND VEHICLE CORROSION MANAGEMENT
Ronald F. Steinmayer *In* AGARD Management of Corrosion May 1985 19 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

The history of U.S. motor vehicle industry anti-corrosion measures is related. Prior to World War II corrosion was not a major concern for vehicles, which were made of heavy-gage steel, and deicing materials were seldom used. Following the war, major design innovations permitted the use of thinner gage metals. Also, increased, all weather highway use required the use of salt in freezing conditions. Vehicle corrosion became endemic. During the 60's rust-proofing became a must. Since then corrosion resistance has been further enhanced by better design, pre-coated metals, improved paint systems, good sealing techniques, and special augmentation coatings. Improved laboratory and proving ground test procedures, field survey and fleet evaluations provide reliable and accurate data on the corrosion performance of specific materials and test vehicles. F.M.R.

N85-33247# Michigan State Univ., East Lansing. Dept. of Metallurgy, Mechanics and Materials Dept.
RELATING CORROSION MAINTENANCE TO ENVIRONMENTAL FACTORS
Robert Summitt *In* AGARD Management of Corrosion May 1985 15 p refs (For primary document see N85-33238 22-26)
Avail: NTIS HC A08/MF A01

Aircraft inspections and maintenance should be timely based upon risk of damage, in order to minimize life cycle costs, and to maximize reliability. From the basis of Linear Elastic Fracture Mechanics, Damage-Tolerant Design, and Reliability-Centered Maintenance, optimum intervals have been developed with respect to fatigue and wearout failure. Such, however, is not the case for corrosion. Studies of maintenance in USAF aircraft systems have shown, nonetheless, that corrosion is a stochastic-failure process and can be described by standard models. Moreover, corrosion is predictable from: (1) the probability of initiation, and (2) the kinetics of propagation, both of which are functions of material corrodibility and environmental corrosivity. Some success has been achieved in describing environmental corrosivity in terms of ambient conditions. Thus, although the state of the art in corrosion-failure prediction lags that of fatigue-failure prediction by some two decades, the necessary foundation has been developed from which corrosion can be rapidly integrated into inspection/maintenance scheduling. Author

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-33248*# Clarkson Univ., Potsdam, N.Y.
EXPERIMENTAL STUDIES OF GLASS REFINING Annual Report
R. Shankar Subramanian, Robert Cole, and Pericles Kondos Feb. 1984 55 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-956460; JPL Proj. 9950-1075)
(NASA-CR-176130; NAS 1.26:176130; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11B

The basic components of the experimental apparatus were selected and acquired. Techniques were developed for the fabrication of the special crucibles necessary for the experiments. Arrangements were made for the analysis of glass and gas bubble samples for composition information. Donations of major equipment were received for this project from Owens, Illinois where a similar study had been conducted a few year ago. Decisions were made regarding the actual glass composition to be used, the gas to be used in the first experiments, and the temperatures at which the experiments should be conducted. A microcomputer was acquired, and work was begun on interfacing the video analyzer to it. Author

N85-33249*# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLID-MELT INTERFACE STUDIES OF HIGH-SPEED SILICON SHEET GROWTH Final Technical Progress Report, Jul. 1983 - Jul. 1984
T. F. Ciszek Mar. 1985 69 p refs Sponsored in part by NASA Prepared in cooperation with JPL, Pasadena, Calif.
(Contract DE-AC02-83CH-10093)
(NASA-CR-176112; JPL-9950-1156; NAS 1.26:176112; DE85-008783; DOE/JPL-WO8746-02; SERI/PR-212-2634) Avail: NTIS HC A02/MF A01 CSCL 11G

Radial growth-rate anisotropies and limiting growth forms of point-nucleated, dislocation-free silicon sheets spreading horizontally on the free surface of a silicon melt have been measured for (100), (110), (111), and (112) sheet planes. Analysis of the sheet edges has led to predicted geometries for the tip shape of unidirectional, dislocation-free, horizontally growing sheets propagating in various directions within the above-mentioned planes. Feasibility was demonstrated for a crucible-free horizontal (CFH) ribbon growth method. High-purity, cold-crucible melt confinment was used to grow silicon sheets by edge-supported pulling (ESP). Quartz capillary filaments were used. Solar cell data on these sheets are presented. Also cell, lifetime, mobility, spreading resistance X-ray topography, and neutron activation analysis data were obtained for dislocation-free cylindrical ingots of [111] and [100] orientation. X-ray topography analysis of dendritic web silicon sheets was conducted and the resultant topographs are presented in this report. A possible correlation between slip dislocations, and web cell efficiency was seen. Float zoning studies were initiated for high-purity, dislocation-free silicon to be applied to high-efficiency silicon solar cells. Author

N85-33250*# KMS Fusion, Inc., Ann Arbor, Mich. Div. of Materials Sciences.
RESEARCH STUDY FOR GEL PRECURSORS AS GLASS AND CERAMIC STARTING MATERIALS FOR SPACE PROCESSING APPLICATIONS RESEARCH Annual Report, 13 Dec. 1982 - 13 Dec. 1983
Raymond L. Downs and Wayne J. Miller 12 Mar. 1983 49 p refs Prepared for JPL, Pasadena, Calif.
(Contracts NAS7-100; JPL-956403; JPL Proj. 9950-1074)
(NASA-CR-176113; NAS 1.26:176113) Avail: NTIS HC A03/MF A01 CSCL 11B

The development of techniques for the preparation of glass and ceramic starting materials that will result in homogeneous glasses or ceramic products when melted and cooled in a containerless environment is described. Metal-organic starting materials were used to make compounds or mixtures which were then decomposed by hydrolysis reactions to the corresponding oxides. The sodium tungstate system was chosen as a model for a glass with a relatively low melting temperature. The alkoxide tungstates also have interesting optical properties. For all the compositions studied, comparison samples were prepared from inorganic starting materials and submitted to the same analyses. Author

N85-33251*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
STRESS AND EFFICIENCY STUDIES IN EFG Quarterly Progress Report, 1 Jan. - 31 Mar. 1985
15 May 1985 43 p refs Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176125; NAS/JPL-9950-1158; NAS 1.26:176125; DE85-013589; DOE/JPL-956312-85-11) Avail: NTIS HC A03/MF A01 CSCL 11G

Detailed EBIC characterization of stressed FZ and CZ silicon of varying oxygen and carbon levels was carried out. The bulk diffusion lengths are limited by point defect recombination to about 15 to 25 microns in dislocation free regions after the high temperature heat treatment and stress application. Increases in dislocation density from 1 x 1000 sq. cm to over 1 x 10 to the 7th power sq cm further decrease the diffusion length to the range 10 to 15 microns. One hour anneals at 575 C and 850 C produce little increase in diffusion length, while preferential gettering at dislocations is weak. Significant differences in silicon with varying oxygen and carbon levels are not observed. Four-point bending was carried out at 1000 C and lower to provide more samples to continue the studies on electrical activity of dislocations. Several modified afterheater shield configurations were tested in Furnace 17 and ribbon was grown to attempt to minimize dislocation densities. Stress distribution profiles are also being calculated for some growth configurations. Author

N85-33252# Department of Energy, Washington, D. C.
DISPERSION TOUGHENED CERAMIC COMPOSITES AND METHOD FOR MAKING SAME Patent Application
D. P. Stinton (ORNL, Tenn.), W. J. Lackey (ORNL, Tenn.), and R. J. Lauf, inventors (to DOE) (ORNL, Tenn.) Filed 28 Sep. 1984 9 p
(Contract DE-AC05-84CR-21400)
(DE85-011601; US-Patent-Appl-SN-655488) Avail: NTIS HC A02/MF A01

Ceramic composites exhibiting increased fracture toughness are produced by the simultaneous codeposition of silicon carbide and titanium disilicide by chemical vapor deposition. A mixture of hydrogen, methyltrichlorosilane and titanium tetrachloride is introduced into a furnace containing a substrate such as graphite or silicon carbide. The thermal decomposition of the methyltrichlorosilane provides a silicon carbide matrix phase and the decomposition of the titanium tetrachloride provides a uniformly dispersed second phase of the intermetallic titanium disilicide within the matrix phase. The fracture toughness of the ceramic composite is in the range of about 6.5 to 7.0 MPa (RADICAL)m which represents a significant increase over that of silicon carbide. DOE

N85-33253# Department of Energy, Washington, D. C.
METALLIC GLASS COMPOSITION Patent Application
D. M. Kroeger (ORNL) and C. C. Koch, inventors (to DOE) (ORNL) Filed 14 Sep. 1984 11 p
(Contract DE-AC05-84OR-21400)
(DE85-011594; US-Patent-Appl-SN-650464) Avail: NTIS HC A02/MF A01

A metallic glass alloy is described that is either iron based or nickel based or based on a mixture of iron and nickel, containing lesser amounts of elements selected from the group boron, silicon, carbon and phosphorous. An amount of a ductility enhancing element selected from the group cerium, lanthanum, praseodymium and neodymium sufficient to increase ductility of the metallic glass upon annealing is added. DOE

N85-33254# Department of Energy, Washington, D. C.
SODIUM NITRATE CONTAINING MIXTURE FOR PRODUCING CERAMIC-GLASS-CERAMIC SEAL BY MICROWAVE HEATING Patent Application
R. D. Blake (LANL, N. Mex.) and T. T. Meek, inventors (to DOE) (LANL, N. Mex.) Filed 10 Oct. 1984 12 p
(Contract W-7504-eng-36)
(DE85-011610; US-Patent-Appl-SN-659586) Avail: NTIS HC A02/MF A01

A mixture for, and method of using such a mixture, for producing a ceramic-glass-ceramic seal by the use of microwave energy are disclosed, wherein the mixture comprises a glass sealing material, a coupling agent, and an oxidizer. The seal produced exhibits greater strength due to its different microstructure. Sodium nitrate is the most preferred oxidizer. DOE

N85-33255# Department of Energy, Washington, D. C.
IMPROVED PROCESS FOR THE PREPARATION OF FIBER-REINFORCED CERAMIC COMPOSITES BY CHEMICAL VAPOR DEPOSITION Patent Application
W. J. Lackey, Jr. (ORNL) and A. J. Caputo, inventors (to DOE) (ORNL) Filed 7 Sep. 1984 24 p
(Contract DE-AC05-84OR-21400)
(DE85-011584; US-Patent-Appl-SN-648398) Avail: NTIS HC A02/MF A01

A specially designed apparatus provides a steep thermal gradient across the thickness of fibrous preform. A flow of gaseous ceramic matrix material is directed into the fibrous preform at the cold surface. The deposition of the matrix occurs progressively from the hot surface of the fibrous preform toward the cold surface. Such deposition prevents the surface of the fibrous preform from becoming plugged. As a result thereof, the flow of reactant matrix gases into the uninfiltrated (undeposited) portion of the fibrous preform occurs throughout the deposition process. The progressive and continuous deposition of ceramic matrix within the fibrous preform provides for a significant reduction in process time over known chemical vapor deposition processes. DOE

N85-33256# Department of Energy, Washington, D. C.
METHOD FOR PREPARING Pb-(BETA)-ALUMINUM CERAMIC Patent Application
E. E. Hellstrom, inventor (to DOE) (Sandia Lab., Albuquerque, N. Mex.) Filed 30 Aug. 1984 15 p
(Contract DE-AC04-76DP-00789)
(DE85-011665; US-Patent-Appl-SN-645651) Avail: NTIS HC A02/MF A01

A process is disclosed for preparing impermeable, polycrystalline samples of Pb-(BETA)''-alumina ceramic from Na-(BETA)''-alumina ceramic by ion exchange. The process comprises two steps. The first step is a high temperature vapor phase exchange of Na by K, followed by substitution of Pb for K by immersing the sample in a molten Pb salt bath. The result is a polycrystalline Pb-(BETA)''-alumina ceramic that is substantially crack free. DOE

N85-33257# Department of Energy, Washington, D. C.
ELECTRON-DONOR DOPANT, METHOD OF IMPROVING CONDUCTIVITY OF POLYMERS BY DOPING THEREWITH, AND A POLYMER SO TREATED Patent Application
R. Liepins and M. Aldissi, inventor (to DOE) Filed 27 Jul. 1984 18 p
(Contract W-7405-eng-36)
(DE85-011640; US-Patent-Appl-SN-635020) Avail: NTIS HC A02/MF A01

Polymers with conjugated backbones, both polyacetylene and polyaromatic heterocyclic types, are doped with electron donor agents to increase their electrical conductivity. The electron donor agents are either electride dopants made in the presence of lithium or dopants derived from alkalides made in the presence of lithium. The dopants also contain a metal such as cesium and a trapping agent such as a crown ether. DOE

N85-33258# Department of Energy, Washington, D. C.
POLYMER BLENDS FOR USE IN PHOTOELECTROCHEMICAL CELLS FOR CONVERSION OF SOLAR ENERGY TO ELECTRICITY Patent Application
T. Skotheim, inventor (to DOE) Filed 28 Sep. 1984 21 p
(Contract DE-AC02-76CH-00016)
(DE85-011602; US-Patent-Appl-SN-655489) Avail: NTIS HC A02/MF A01

There is disclosed a polymer blend of a highly conductive polymer and a solid polymer electrolyte that is designed to achieve better charge transfer across the conductive film/polymer electrolyte interface of the electrochemical photovoltaic cell. The highly conductive polymer is preferably polypyrrole or poly-N-p-nitrophenylpyrrole and the solid polymer electrolyte is preferably polyethylene oxide or polypropylene oxide. DOE

N85-33259# Department of Energy, Washington, D. C.
RADIATION-HARDENED POLYMERIC FILMS Patent Application
C. Arnold, Jr. (Sandia Labs., Albuquerque, N. Mex.), R. C. Hughes (Sandia Labs., Albuquerque, N. Mex.), R. G. Kepler (Sandia Labs., Albuquerque, N. Mex.), and S. R. Kurtz, inventors (to DOE) Filed 16 Jul. 1984 17 p
(Contract DE-AC04-76DP-00789)
(DE85-011636; US-Patent-Appl-SN-632347) Avail: NTIS HC A02/MF A01

The radiation induced conductivity of polymeric dielectrics with low electronic mobility is reduced by doping with electron donor or electron acceptor compounds at a level of 10 to the 15th power molecules of dopant/cm(3). Polyesters, polyolefins, perfluoropolyolefins, vinyl polymers, vinylidene polymers, polycarbonates, polysulfones and polyimides benefit from such a treatment. Usable dopants include 2,4,7-trinitro-9-fluorenone, tetracyanethylene, 7,7,8,8-tetracyanoquinodimethane, m-dinitrobenzene, 2-isopropylcarbazole, and triphenylamine. DOE

N85-33260# California Inst. of Tech., Pasadena.
CONSORTIUM PROGRAM FOR THE STUDY OF BORON-RICH BORIDES
C. Wood and D. Emin [1985] 2 p Prepared in cooperation with Sandia Labs., Albuquerque, N. Mex.
(Contract DE-AC04-76DP-00789)
(DE85-011378; SAND-85-1094C) Avail: NTIS HC A02/MF A01

The boron-rich borides are quite distinctive refractory solids. Existing evidence suggests that they could be developed into very high temperature semiconductors. These would operate above 1000 C, thereby leapfrogging current efforts on traditional 3 to 5 semiconductors. However, to properly assess this potential requires increasing the present small effort to a moderate size. To accomplish this, we propose the establishment of a research consortium involving national laboratories, universities and industrial laboratories with a funding level between $0.5 and $1.0 M. DOE

N85-33261# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
MICROSTRUCTURE-MECHANICAL PROPERTY RELATIONSHIPS IN THE TRANSFORMATION-TOUGHENED CERAMICS Progress Report
A. H. Heuer 15 Jan. 1985 16 p
(Contract DE-FG02-84ER-45110)
(DE85-011946; DOE/ER-45110/T1) Avail: NTIS HC A02/MF A01

Research on transformation toughened ZrO2-containing ceramics is underway. Investigations are carried out of Ostawald ripening in ZrO2-toughened Al2O3 (ZTA), plastic deformation of stabilized ZrO2 single crystals, and the stress-induced tetragonal (YIELDS) monoclinic martensitic transformation in Y2O3-containing tetragonal ZrO2 polycrystals. DOE

N85-33262# Midwest Research Inst., Golden, Colo.
MONOSILANE AND DISILANE, 1984 REPORT Status Report, 1984
J. Lorenz Mar. 1985 44 p
(Contract DE-AC02-83CH-10093)
(DE85-008776; SERI/STR-211-2575) Avail: NTIS

HC A03/MF A01

Information is given on the improvements in the quality of monosilane and disilane now commercially available. Suppliers' analyses are tabulated along with capacity data. Suppliers currently have a higher purity grade of silane than previously, which yields a deposited silicon film with a resistivity of more than 1000 ohm-cm. Prices and grades are listed for the silane gases available in the United States and Japan. The silent electric discharge method of preparing disilane from silane is reviewed, with references. Properties and stability data for disilane are given. Handling and shipping of the silane gases are discussed, along with data on health hazards. Analytical procedures for determining impurities in silanes are listed; sensitivities are generally only to the 1 ppM level. Analyses for boron, phosphorus, arsenic, and antimony in silane would be useful for photovoltaic work at the parts-per-trillion level: suggestions are given for possible techniques that might be developed to achieve this. DOE

N85-33263# Pennsylvania State Univ., University Park. Materials Research Lab.

EXPERIMENTAL CHARACTERIZATION AND STABILITY OF SALT- AND NONSALT-CONTAINING GROUTS AND MORTARS (BCT-1F- AND BCT-1FF-RELATED)

M. W. Grutzeck and D. M. Roy May 1985 97 p refs

(Contract DE-AC02-83CH-10140)

(DE85-012339; BMI/ONWI-568) Avail: NTIS HC A05/MF A01

Selected cementitous formulations related to the BCT series were prepared as candidate salt repository sealing materials for both salt and nonsalt bearing strata. Mixture 83-03 is a salt containing mixture related to BCT-1F except that 83-03 is a dense sanded grout containing quartz sand. Mixture 83-06 resembles BCT-1FF except that 83-06 is a siliceous sanded grout containing both quartz sand and a small percentage of micron sized silica floor. In general, mixtures 83-03 and 83-06 are representative of either expensive salt containing mixtures (83-03, BCT-1F, 83-05) or salt free mixtures (82-30, 83-06, BCT-1FF). On the whole, the grouts in either group have low permeabilities and high strengths and elastic moduli, although the salt free mixtures are stronger and have higher moduli than the saline materials. Thermodynamic stability of the expansive phaso, ettringite, is discussed, and the implications of its stability for developing and maintaining a seal are considered. DOE

N85-33264# Language Services, Nashville, Tenn.

PROCESS AND DEVICE FOR FORMING IMPRINTS ON CERAMIC TUBES

Jacques Guillot, Paul Tritten, and Jean-Louis Weber 1985 18 p Transl. into ENGLISH of French Patent no. 78-33446 (27 Nov. 1978)

(Contract DE-AC05-84CT-21400)

(DE85-013137; K-Trans-299) Avail: NTIS HC A02/MF A01

The purpose of the present invention is a process and a device for making imprints on ceramic tubes and these ceramic tubes with imprints. It is known that in uranium enrichment processes by gaseous diffusion, microporous tubes are used to make the diffuser units used for the application of this isotope enrichment process. It is sknown that these microporous tubes are generally made in two stages. In a first stage, a macroporous ceramic tube called a support is made. In a second stage, an internal microporous deposit is made which makes it possible to obtain a tube called a barrier finally having the required porosity to apply the gaseous diffusion enrichment process. The present invention involves the first stage of the manufacturing process of the barriers and, more precisely, a step in the manufacturing process of the supports that makes it possible to improve the efficiency of these barriers. DOE

N85-33265# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

IMPLEMENTATION OF POLYMER IMPREGNATION AS A BRIDGE DECK SEALANT Final Report

W. G. Smoak Sep. 1984 76 p refs Sponsored by Federal Highway Administration

(PB85-185718; REC-ERC-84-11) Avail: NTIS HC A05/MF A01 CSCL 13M

The surface treatment procedure for partially polymer impregnating concrete bridge decks is refined and evaluated on eight full-size highway bridges in various geographical locations over a period of 8 years. Data concerning the costs of bridge deck impregnation are included. An extensive series of chloride ion intrusion tests were performed and results are reported. An appendix containing the most recent surface impregnation construction specifications is included. Author (GRA)

N85-33523*# British Aerospace Public Ltd. Co., Stevenage (England).

THE USE OF PERFLUOROETHER LUBRICANTS IN UNPROTECTED SPACE ENVIRONMENTS

Bryan H. Baxter and Barry P. Hall *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 179-207 (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 11H

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-33266# Department of Energy, Washington, D. C.

SUPERHEATED FUEL INJECTION FOR COMBUSTION OF LIQUID-SOLID SLURRIES Patent Application

F. A. Robben, inventor (to DOE) (California Univ., Livermore. Lawrence Livermore Lab.) Filed 19 Oct. 1984 24 p

(Contract DE-AC03-76SF-00098)

(DE85-011624; US-Patent-Appl-SN-662658) Avail: NTIS HC A02/MF A01

A method and device are claimed for obtaining, upon injection, flash evaporation of a liquid in a slurry fuel to aid in ignition and combustion. The device is particularly beneficial for use of coal-water slurry fuels in internal combustion engines such as diesel engines and gas turbines, and in external combustion devices such as boilers and furnaces. The slurry fuel is heated under pressure to near critical temperature in an injector accumulator, where the pressure is sufficiently high to prevent boiling. After injection into a combustion chamber, the water temperature will be well above boiling point at a reduced pressure in the combustion chamber, and flash boiling will preferentially take place at solid-liquid surfaces, resulting in the shattering of water droplets and the subsequent separation of the water from coal particles. This prevents the agglomeration of the coal particles during the subsequent ignition and combustion process, and reduces the energy required to evaporate the water and to heat the coal particles to ignition temperature. The overall effect will be to accelerate the ignition and combustion rates, and to reduce the size of the ash particles formed from the coal. DOE

N85-33267# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex.

EXPLOSIVE CONTAINMENT STUDY

J. R. Anthony and P. A. Foster Feb. 1985 20 p

(Contract DE-AC04-76DP-00487)

(DE85-011719; MHSMP-85-04) Avail: NTIS HC A02/MF A01

The purpose of this study was to determine if a quasi-static pressure could be predicted for non-vented LX-13 detonations in small containers. The prediction equation proposed by M.G. Vigil of Sandia National Laboratories is P = 2254 (w/v). Three alloy steel containers were designed to contain the pressures predicted to be generated by LX-13 weight-to-volume ratios varying from 0.06:1 to 3.50:1 lb/ft(3). Two methods were planned to measure internal pressures (strain gages on the outside walls and pressure transducers penetrating a wall). The strain gages were noisy and

too delicate, therefore, they were not used. The pressure transducers were satisfactory but usually were destroyed after one or two tests. The predicted pressure varied from about 60 to 7900 psi and linear regression analysis of the actual data shows a very good curve fit with a correlation coefficient of 0.9985. DOE

N85-33268# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTAL STUDY OF ENGINE KNOCK
R. M. Green and J. R. Smith 1984 14 p Presented at the Spring Meeting of the Combust. Inst., Boulder, Colo., 2 Apr. 1984
(Contract DE-AC04-76DR-00789)
(DE85-009851; WSS/CI-84-46; CONF-8404104-4) Avail: NTIS HC A02/MF A01

Raman and emission spectroscopy, laser induced fluorescence, schlieren photography, and gas sampling have been used in a single cylinder, spark ignition engine to study preflame conditions and reactions that lead to knock. The intake manifold temperature and pressure were used to control the fraction of fuel autoigniting in a 5.1 compression ratio engine. N-butane and isobutane were studied, and both were found to knock within the range of achievable inlet conditions. In the present experiment, knock is the result of a dramatic increase in the rate of heat release caused by the nearly homogeneous autoignition of the compression-heated end gas. Detonation waves could not be detected and do not appear to be necessary for the occurrence of knock. Preflame reactions involving OH and CH radicals producing carbon monoxide, formaldehyde and faint blue light were observed. DOE

N85-33269# Los Alamos Scientific Lab., N. Mex.
SENSITIVITY AND PERFORMANCE CHARACTERIZATION OF DINGU
M. M. Stinecipher and L. A. Stretz 1985 7 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract W-7405-eng-36)
(DE85-010750; LA-UR-85-1390; CONF-850706-18) Avail: NTIS HC A02/MF A01

DINGU, as a relatively insensitive high explosive (HF), may have interesting applications. Better methods for preparation and characterization are in work A particle size suitable for formulating this compound into a PBX is achieved and DINGU/binder by plate dent. The sensitivity of DINGU is compared with that of TATB in small scale tests. Author

N85-33270# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTAL STUDIES OF CHEMICAL REACTIVITY DURING SHOCK INITIATION OF HEXANITROSTILBENE
R. E. Setchell 1985 40 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-011726; SAND-85-0761C; CONF-850706-19) Avail: NTIS HC A03/MF A01

A new experimental approach is used to examine the release of chemical energy during shock initiation of hexanitrostilbene (HNS). In this approach, the intensity of visible emission from an explosive/window interface, intergrated over the spectral range of 550 to 800 nm, is recorded in time as a measure of local chemical reactivity at this interface. Simultaneously, VISAR measurements are made of the particle velocity of the same interface in order to examine the relative effect of the energy release on the wave motion. Sustained and short-short-duration shocks, having pressures from 2.3 GPa to 4.0 GPa, are generated in two types of HNS materials that previously have shown significant differences in shock sensitivity. The emission intensity is found to be a very sensitive that the temporal and spatial behavior of energy release during shock initiation is quite different in the two types of HNS. DOE

N85-33271# Sandia Labs., Albuquerque, N. Mex.
MODELING GRANULAR EXPLOSIVE DETONATIONS WITH SHEAR BAND CONCEPTS
M. E. Kidd 1985 8 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-011823; SAND-84-1860C; CONF-850706-20) Avail: NTIS HC A02/MF A01

In theories that are formulated to describe shock-induced reactions in granular explosives, it is necessary to identify and model mechanisms that contribute to the growth or decay of the reaction. The concept of hot spot formation and subsequent reaction is examined on the basis of recent work on shear-band nucleation. In this context, the energy dissipated by the shock preferentially heats a volume fraction of the material to a relatively high local temperature. Heat conduction takes place driving the temperatures toward equilibrium, in competition with the reaction of the heated material. As the amplitude of loading increases, the volume of nucleated hot material also increases, thus decreasing the volume of cold material remaining that must decompose by grain burning. DOE

N85-33272# Institut Franco-Allemand de Recherches, St. Louis (France).
HYDRAZINE NITRATE BASED EXPLOSIVES [SPRENGSTOFFE AUF DER BASIS VON HYDRAZINNITRAT]
H. H. Licht 5 Nov. 1984 9 p In GERMAN Presented at 8th Arbeitsgespraechs ueber Spreng- und Zuendstoffe, Mannheim, West Germany, 31 Oct. 1984
(ISL-CO-229/84) Avail: NTIS HC A02/MF A01

The physical properties of hydrazine nitrate are described with a view to its application in explosives. It is a water-soluble salt which is less hygroscopic than the related ammonium nitrate. It melts at 71C; the sedimentation problem has to be tackled by a careful grain size choice. It is sufficiently thermally stable; it reacts agressively with iron and aluminum powders, and especially with copper. It is a less sensitive explosive than trinitrotoluene; sensitivity to percussion is 0.65 m kg. In contrast to solid HN, liquid HN is an extremely sensitive explosive; only nitroglycerin is more sensitive. Explosives based on HN have detonation properties which can hardly be obtained with other substances; the most extraordinary property is that the detonation characteristic is not only superior to that of classical explosives, but also partly to that of the starting substances. Author (ESA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-33273# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
LASER SEALED EVACUATED WINDOW GLAZINGS
D. K. Benson, C. E. Tracy, and G. J. Jorgensen Oct. 1984 8 p refs Presented at the 28th Ann. SPIE Intern. Tech. Symp. on Opt. and Electro-Opt., San Diego, Calif., 19-24 Aug. 1984
(Contracts DE-AC02-83CH-10093; EG-77-C-01-4042)
(DE85-000512; SERI/TP-255-2454) Avail: NTIS HC A02/MF A01

The design and fabrication of a highly insulating, evacuated window glazing were investigated. A thermal network model was used to parametrically predict the thermal performance of such a window. Achievable design options are predicted to provide a glazing with a thermal conductance less than 0.6 W/sq m K which is compact, lightweight and durable. A CO2 laser was used to produce a continuous, leak tight, welded glass perimeter seal around 25 x 25 sq cm test specimens. Various diameters of regularly spaced spherical support spacers were incorporated in the specimens as well as an integral SnO2:F transparent, low emissivity coating for suppression of radiative heat transfer. Laser sealing rates of .06 cm/s were achieved at a 580 C glass working temperature with 400 W of continouous wave (CW) laser power. E.A.K.

N85-33274# Washington Univ., Seattle. Nuclear Physics Lab.
CRYOGENIC SYSTEM FOR THE UNIVERSITY OF WASHINGTON

SUPERCONDUCTING BOOSTER
D. I. Will 15 Oct. 1985 9 p refs Symp. of Northeastern Accelerator Personnel, Stony Brook, N.Y., 15 Oct. 1984
(Contract DE-AC06-84ER-40124)
(DE85-010604; DOE/ER-40124/T4; CONF-8410172-9) Avail: NTIS HC A02/MF A01

The status and a general description of the cryogenic system under construction for the University of Washington Superconducting Booster is presented. The system consists of a helium refrigerator, a cryogenic distribution system, fourteen cryostats, and storage vessels for liquid and gaseous helium and liquid nitrogen. The physical layout of the cryogenic system with a simplified schematic of the helium portion is given. DOE

N85-33275# Sandia Labs., Albuquerque, N. Mex.
VACUUM INTERFACE FLASHOVER WITH BIPOLAR ELECTRIC FIELDS
W. K. Tucker, R. A. Anderson, D. E. Hasti, E. E. Jones, and L. F. Bennett May 1985 13 p refs Presented at 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012027; SAND-84-2398C; CONF-850616-1) Avail: NTIS HC A02/MF A01

High energy, compact, particle accelerators require accelerating cavities that have large gradients and operate with high efficiency. The bipolar electric fields required in these efficient accelerating cavities place severe requirements on the vacuum interface. Experimentally, it was found that the bipolar flashover field varies as t sup - 1/2 for times out to 300 ns and then remains essentially constant at 33 kV/cm for longer duration waveforms, whereas materials subjected to unipolar electric fields follow a t sup - 1/6 relationship. Furthermore, specific accelerating cavities offer enhancements that may be employed to achieve highly uniform electric fields across the vacuum interface. Using these results and the results of a previously developed theory of unipolar flashover, a new interface has been designed and 50 kV/cm bipolar flashover field achieved for a waveform train that lasted 1 (MU)s. DOE

N85-33276# Factory Mutual Engineering, Norwood, Mass.
FIRE PROTECTION REVIEW REVISIT NO. 2, ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
P. H. Dobson, M. W. Earley, and L. J. Mattern May 1985 91 p
(Contract DE-AC01-84PE-17056)
(DE85-013245; DOE/PE-17056-T3) Avail: NTIS HC A05/MF A01

A fire protection survey was conducted at Argonne National Laboratory on April 1-5, 8-12, and April 29-May 2, 1985. The purpose was to review the facility fire protection program and to make recommendations or identify areas according to criteria established by the Department of Energy. There has been a substantial improvement in fire protection at this laboratory since the 1977 audit. Numerous areas which were previously provided with detection systems only have since been provided with automatic sprinkler protection. The following basic fire protection features are not properly controlled: (1) resealing wall and floor penetrations between fire areas after installation of services; (2) cutting and welding; and (3) housekeeping. The present Fire Department manpower level appears adequate to control a route fire. Their ability to adequately handle a high-challenge fire, or one involving injuries to personnel, or fire spread beyond the initial fire area is doubtful. DOE

N85-33277# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.
EVALUATION STUDY OF MECHANICAL REFRIGERATION SYSTEMS FOR APPLICATION TO SPACE MISSIONS Final Report [ETUDE D'EVALUATION DES CONCEPTS DE REFRIGERATEURS MECANIQUES APPLICABLES A DES MISSIONS SPATIALES]
M. D. Imbert, A. Faure (Air Liquide), A. Ravex (Air Liquide), M. P. Seyfert, and A. Duwetz (Societe Europeene de Propulsion) Paris ESA 28 Aug. 1984 82 p Prepared in cooperation with CEA
(Contract ESTEC-5629/83/NL-PB(SC))
(SNIAS-1029ACA/LL/V; ESA-CR(P)-2016) Avail: NTIS HC A05/MF A01

Mechanical refrigeration systems to provide 100 mW power at 4 K are studied. A two stage Stirling system, a Joule Thomson system with mechanical or absorption mechanics, and magnetic cycle refrigerator are considered. Preliminary specifications for all three types of mechanics are given. Magnetic suspensions are included in the design of the Stirling Machine. The planning of the development is outlined. Author (ESA)

N85-33278# Research Inst. of National Defence, Stockholm (Sweden).
SHELTER: DESCRIPTION OF A PROGRAM CODE
Carl Reuterswaerd Mar. 1985 62 p In SWEDISH; ENGLISH summary
(FOA-C5-85-0002-H1; ISSN-0347-7665) Avail: NTIS HC A04/MF A01

A program to compute the climate in shelters using the structural parameters of the building, the definition of the environment, the thermal transfer through the walls, and the thermal flow in the shelter is described. Energy flow sheet the spontaneous convection at the wall inside and corresponding coefficients the computation of the equivalent heat transfer for walls the heat transfer in the Earth around the building Ficks law and test measurements are examined. A flow sheet for the external segment is presented. Author (ESA)

N85-33279# Fauske and Associates, Inc., Burr Ridge, Ill.
SOLID DESICCANT DEHUMIDIFICATION SYSTEMS FOR RESIDENTIAL APPLICATIONS Final Report, Oct. 1983 - Mar. 1985
T. J. Marciniak, M. A. Grolmes, and M. Epstein Mar. 1985 118 p refs
(PB85-198489; FAI-85/15; GRI-85/0072) Avail: NTIS HC A06/MF A01 CSCL 13A

It is shown that gas regenerated desiccant dehumidifiers (GRDD) can be economically superior to vapor compression units in the hot, humid climates of the southeast and south. Altough the first cost of a GRDD unit is significantly higher than a vapor compression dehumidifier, reduced operating costs and savings in the installed cost of smaller air-conditioning units can provide an economic means for effective humidity control. The economic benefits are dependent upon: (1) the number of hours of dehumidifier operation per year; and (2) electricity and natural gas cost differentials. Of secondary importance is the coefficient of performance (COP) of the units. Recommendations for additional research and development for a commercial GRDD product line are outlined. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-33280 Royal Signals and Radar Establishment, Malvern (England).
PRECISION MICROWAVE ATTENUATION MEASUREMENT BY TIME INTERVAL RATIO
P. Cummings and R. H. Johnson Mar. 1985 47 p refs
(RSRE-85005; BR95524) Copyright. Avail: NTIS HC A03/MF A01

A method of measuring microwave attenuation by substitution is described. As attenuation is inserted into the device under test, the pulse repetition frequency of a pulse modulated PIN diode switch in series with the device is changed to maintain a constant mean power output from the circuit. The ratio of the pulse repetition frequencies before and after insertion is shown to be simply related to the attenuation of the device under test. Error sources are

examined. Results show inaccuracies < + or 0.002 dB over a range of 0 to 20 dB. Author (ESA)

N85-33281# Defense Communications Engineering Center, Reston, Va.
A MODEL FOR PREDICTING PROPAGATION-RELATED DSCS (DEFENSE COMMUNICATIONS ENGINEERING CENTER) MARGIN REQUIREMENTS
C. F. Shultheis 28 Feb. 1985 30 p
(AD-A155355; DCEC-TN-5-85) Avail: NTIS HC A03/MF A01 CSCL 17/2

This technical report describes an analysis of the performance allocations for a satellite link, focusing specifically on a single-hop 7 to 8 GHz link of the Defense Satellite Communications System (DSCS). The analysis is performed for three primary reasons: (1) to reevaluate link power margin requirements for DSCS links based on digital signalling; (2) to analyze the implications of satellite availability and error rate allocations contained in proposed MIL-STD-188-323, system design and engineering standards for long haul digital transmission system performance; and (3) to standardize a methodology for determination of rain-related propagation constraints. The aforementioned methodology is then used to calculate the link margin requirements of typical DSCS binary/quaternary phase shift keying (BPSK/QPSK) links at 7 to 8 GHz for several different Earth terminal locations. GRA

N85-33282# Naval Research Lab., Washington, D. C.
POWER DENSITY AND THRESHOLD CONTROL STRATEGIES FOR RADAR TRACK INITIATION Interim Report, Jun. 1984 - Feb. 1985
B. H. Cantrell 23 May 1985 13 p
(Proj. RR0-2105)
(AD-A155357; NRL-8895) Avail: NTIS HC A02/MF A01 CSCL 17/9

This report describes a strategy for controlling the power density and thresholds on a pulse-to-pulse basis on long range surveillance radars having fixed power aperture products for the purpose of improving a target track initiation range. By using a mathematical model and Monte-Carlo simulations, it was found that the track initiation range could be significantly increased for the specific cases studied. The improvements varied from about 20% to 50% depending on the strategies and conditions. An argument was constructed that showed that these improved track initiation ranges were obtained without significant degradation in radar performance for other targets as long as the target density was not too large. GRA

N85-33283# Mitre Corp., Bedford, Mass.
ASSURED INFORMATION FLOW CAPPING ARCHITECTURE Final Report
M. D. Black and N. A. Carvin May 1985 102 p
(Contract F19628-84-C-0001)
(AD-A155392; MTR-9492; ESD-TR-84-203) Avail: NTIS HC A06/MF A01 CSCL 17/2

The Tactical Air Control System (TACS) is that set of Tactical Air Force assets used to assess the air and ground situation, and to plan, allocate, commit, and control assigned resources. Previous studies noted that the TACS elements should be more highly distributed to improve survivability in the battlefield of the future. This document reports on the results of the Assured Information Flow Capping Architecture study, which developed governing concepts for communications architectures that can support the information flow requirements of a future, distributed TACS. Architecture comprising existing and planned communications equipment were postulated and compared with a set of goals to identify deficiencies. Architectures using new equipment that resolve many of the deficiencies were then postulated, and areas needing further investigation were identified. GRA

N85-33284# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
SATELLITE LINKS IN THE ISO ARCHITECTURE: MODELS AND PERFORMANCE EVALUATION Ph.D. Thesis [LIAISONS PAR SATELLITE DANS L'ARCHITECTURE ISO: MODELISATION ET EVALUATION DE PERFORMANCES]
Francois Xavier SajoNana 30 Nov. 1984 155 p refs In FRENCH
(ENST-84E017; ISSN-0751-1353) Avail: NTIS HC A08/MF A01

Models of error control in a satellite link are studied and the performance is evaluated. Computerized simulations of the proposed models which validate the models were performed. It is shown that some protocols are not adapted to satellite links with high data rate and high error rate. An error correcting code at high error rates in necessary. The performance of several protocols is discussed. Author (ESA)

N85-33285# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Systemes et Communications.
PHONETIC TRANSCRIPTION STATISTICS: CONSTITUTION AND STATISTICAL UTILIZATION [UN CORPUS DE TRANSCRIPTIONS PHONETIQUES: CONSTITUTION ET EXPLOITATION STATISTIQUE]
Jean-Pierre Tubach and Louis-Jean Boe (Grenoble Univ.) Apr. 1985 58 p refs In FRENCH; ENGLISH summary
(ENST-85D001; ISSN-0751-1345) Avail: NTIS HC A04/MF A01

Statistics gathered from a very large corpus of French phonetic texts (> 300,000 phones) are presented. The results are valuable to study distributional phenomena in the spoken language. Detailed results on phones and sequences of two phones are given, as well as summarized results on sequences of three and four phones. Author (ESA)

N85-33286# Fondazione Ugo Bordoni, Rome (Italy).
PETCOM: A SOFTWARE INSTRUMENT FOR THE ANALYSIS OF PETRI NETWORKS, ORIENTED TOWARDS COMMUNICATION PROTOCOLS [PETCOM: UNO STRUMENTO SOFTWARE PER L'ANALYSI DI RETI DI PETRI ORIENTATE AI PROTOCOLLI DI COMUNICAZIONE]
Achille Pattavina and Sebastiano Trigila Jul. 1983 79 p refs In ITALIAN Sponsored by Istituto Supriore delle Poste e Telecomunicazioni e la Fondazione Stessa
(FUB-50-1983) Avail: NTIS HC A05/MF A01

A computer program for analyzing Petri nets is described. The program is written in FORTRAN 5 for the Univac 1100/82 computer. The capacity and characteristics of the proposed system are specified. Author (ESA)

N85-33287# Fondazione Ugo Bordoni, Rome (Italy).
INTRODUCTION TO ADAPTIVE TECHNIQUES FOR VOICE SIGNAL PROCESSING [INTRODUZIONE ALLE TECNICHE ADATTATIVE PER L'ELABORAZIONE DEL SEGNALE VOCALE]
Giuseppe Martinelli (Rome Univ.), Gianni Orlandi (Rome Univ.), and Mario Salerno (Rome Univ.) Dec. 1983 21 p refs In ITALIAN Sponsored by Amministrazione Poste e Telecomunicazioni
(FUB-52-1983) Avail: NTIS HC A02/MF A01

Predictive filtering of voice signals is discussed. In the adaptive procedure the filter is corrected at each sampling by a function of the error prediction. The initial value problem and the adaptive method to distinguish frequencies inmmersed in white noise are examined. A computer program describing an adaptive filter is included. Author (ESA)

N85-33288# Research Inst. of National Defence, Linkoeping (Sweden).
SENSITIVITY OF COMPRESSIVE RECEIVERS
Hans Bergdal and Rickard Wallden Apr. 1985 9 p refs In SWEDISH; ENGLISH summary Sponsored by Swedish Defence Material Administration
(FOA-C-30385-E4; ISSN-0347-3708) Avail: NTIS HC A02/MF A01; Research Institute of National Defence, Stockholm KR 50

Two methods to calculate compressive receiver sensitivity are shown. The broadband method uses the whole bandwidth of the compression line and applies a weighting calculation for the noise

and the signal attenuations. In the narrowband method, the bandwidth of the compression line, divided by the effective compression factor is used to determine the noise level before the detector, to which the broadband noise from the detector is added, giving the total noise level in the detector. The two approaches can be combined, and present the same analytical expression for receiver sensitivity. Author (ESA)

N85-33289# Commerce Dept., Washington, D.C.
METHOD AND APPARATUS FOR FOUR-BEAM RADAR Patent Application
R. B. Chadwick, inventor (to Commerce Dept.) Filed 10 Dec. 1984 17 p
(PB85-181477; US-Patent-Appl-SN-680114) Avail: NTIS HC A02/MF A01 CSCL 04B

A method and apparatus for remote profiling beams pointing alternately to the north, east, west or south by ordered distribution of phase shifts to elements of a square antenna array are produced. Elements within a given group of four array elements share a related group of four phase shift means. Elements in a group trade phase shift means intragroup but there is no intergroup trading. The arrangement permits four beam capability without unduly increasing the cost or complexity of the radar assembly over prior art assemblies. Also disclosed is a system for tipping the array either virtually or physically to obtain a vertical beam.
GRA

N85-33316# Joint Publications Research Service, Arlington, Va.
METHOD OF STATIC MEASUREMENTS OF ABSOLUTE SCATTERING MATRIX OF RADAR TARGETS Abstract Only
S. N. Polikarpov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 2 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 31-33 Original language document was announced in IAA as A84-38754 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33322# Joint Publications Research Service, Arlington, Va.
POTENTIAL COORDINATE ESTIMATE ACCURACY ESTIMATION ACCURACY BY MULTIPOSITION RADAR SYSTEMS Abstract Only
A. I. Kremer *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1322-1329 Original language document was announced in IAA as A84-43188 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33323# Joint Publications Research Service, Arlington, Va.
OPTIMAL COMPLEX NONLINEAR PROCESSING OF CONTINUOUS AND PULSED SIGNALS Abstract Only
M. S. Yarlykov, M. A. Mironov, and V. S. Artemenkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1330-1338 Original language document was announced in IAA as A84-43189 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33324# Joint Publications Research Service, Arlington, Va.
DETECTION OF SIGNALS FROM COHERENT PULSED RADARS WITH RANDOM VARIATION IN PARAMETERS OF SOUNDING SIGNALS FROM PULSE TO PULSE AGAINST BACKGROUND OF WORST-CASE GAUSSIAN NOISE Abstract Only
V. V. Rodionov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 7 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1339-1346 Original language document was announced in IAA as A84-43190 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33325# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF ADAPTIVE FILTERS FOR TRACKING RADIO SYSTEMS Abstract Only
A. M. Shloma and S. M. Frolov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 7 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1379-1384 Original language document was announced in IAA as A84-43195 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33326# Joint Publications Research Service, Arlington, Va.
DIGITAL HOLOGRAPHIC SYSTHESIS OF PATTERN-FORMING TRANSPARENCIES FOR RING ANTENNA ARRAYS Abstract Only
A. Yu. Grinev, L. P. Yaroslavskiy, N. S. Merzlyakov, V. S. Temchenko, and Ye. N. Voronin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 8 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1266-1273 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33328# Joint Publications Research Service, Arlington, Va.
ADAPTIVE SYNTHESIS OF ANTENNAS WITH SEPARATION OF SIGNALS BY DIRECTION OF ARRIVAL Abstract Only
F. L. Ayzin and B. L. Kozan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 9 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1306-1315 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33329# Joint Publications Research Service, Arlington, Va.
COMPARATIVE CHARACTERISTICS OF OPTICAL MULTIPOSITION PULSE SIGNALS WITH INTERSYMBOL DISTORTION Abstract Only
M. E. Gavlin and V. I. Yemin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 10 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 11-16 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33385# Joint Publications Research Service, Arlington, Va.
MULTITRUNK HIGH-FREQUENCY MULTIPLEXING OF ANTENNA-WAVEGUIDE CHANNELS Abstract Only
A. M. Model, V. A. Stuzhin, and Yu. S. Shkarinov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 4 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 30-33 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33386# Joint Publications Research Service, Arlington, Va.
METHOD OF CONSTRUCTING FOLDING UMBRELLA-TYPE ANTENNA Abstract Only
V. I. Loman and M. V. Gryanik *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 5 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 77-79 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33387# Joint Publications Research Service, Arlington, Va.
FREQUENCY INDEPENDENT PARABOLIC PHASED ANTENNA ARRAY OF LOG PERIODIC ANTENNAS Abstract Only
B. A. Veriga and N. I. Vyakhirev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 6 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 72-74 Previously announced in IAA as A83-45686 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33388# Joint Publications Research Service, Arlington, Va.
MINIMIZING FIELD SCATTERED BY SLENDER DIPOLES Abstract Only
L. I. Ponomarev and A. V. Dolgiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 7 Transl.

into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 48-53 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33398# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF SIGNAL-TO-INTERFERENCE ENERGY RATIO IN DISCRETE-DATA TRANSMISSION Abstract Only
Yu. V. Arzumanyan and A. A. Zakharov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 32 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 23-29 Previously announced in IAA as A84-10218 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33399# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF DISCRIMINATION IN SOME INVARIANT SIGNAL TRANSFORMATIONS Abstract Only
B. A. Atayants and V. P. Rumyantsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 32-33 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 58-60 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33401# Joint Publications Research Service, Arlington, Va.
OPTIMALITY CRITERION FOR HIGH-FREQUENCY CHANNEL IN RECEIVERS OF DISCRETE RADIO SIGNALS Abstract Only
V. V. Palshkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 71-72 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33402# Joint Publications Research Service, Arlington, Va.
CONTROLLABLE COMPANDING IN LOW-FREQUENCY FM RADIO COMMUNICATION SYSTEMS Abstract Only
E. S. Golovin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 34-35 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 73-75 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33405# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF SYSTEM WITH NONIDEAL COMPONENTS FOR OPTIMAL PROCESSING OF RADIO SIGNAL Abstract Only
V. G. Tatarnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 36-37 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 91-93 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33406# Joint Publications Research Service, Arlington, Va.
ESTIMATING OPTIMUM TECHNICAL AND ECONOMIC INDICATORS OF DATA TRANSMISSION SYSTEMS Abstract Only
L. A. Shareyko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 38-39 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 45-48 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33418# Joint Publications Research Service, Arlington, Va.
STRONGLY COUPLED MILLIMETER-BAND WAVEGUIDE DIRECTIONAL COUPLERS Abstract Only
A. N. Akhiyezer *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 54 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 8-11 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-33290 National Physical Lab., Teddington (England). Div. of Electrical Science.
THE Mk.1 NPL DIGITAL SAMPLING ac WATTMETER
J. R. Stockton Jan. 1985 33 p refs
(NPL-DES-82; ISSN-0143-7305) Copyright. Avail: Issuing Activity

The design, testing, and use of a digital sampling wattmeter are described. The wattmeter comprises timing circuits, two analog to digital converters, and a simple microcomputer, with ancillary units. A stable ac oscillator with a phase shifter, attenuators, power amplifiers and passive components is used to generate the required voltage and current independently. The best overall uncertainty achieved is 20 ppm. Author (ESA)

N85-33291 National Physical Lab., Teddington (England). Div. of Electrical Science.
THE MEASUREMENT OF HIGH VALUE RESISTANCES AT THE NPL
S. Harkness and Lesley CaHenderson Dec. 1984 29 p refs
(NPL-DES-81; ISSN-0143-7305) Copyright. Avail: Issuing Activity

Measurement of decade value resistors between 10 to the 9th and 14th power ohms is discussed. Measurements are made using a conventional Wheatstone bridge arrangement. The voltage source used to energize the bridge is made from dc-dc converters filtered such that the ripple on the output is $<$ 1 part in 10,000. It is continuously variable up to 520 V. The build up through lower resistance decades establishes a value for 2 wirewound 1 billion ohm build up boxes. This is transferred to other 1 billion ohm resistors (primarily Welwyn resistors) by substitution using a bridge with a ratio of 1. In this bridge, and in others used to determine higher value resistances, the ratio arms have low values compared to the standard and test resistors but not so low as to suffer from changes due to self heating. Decade values from 10 billion to 1000 billion ohms are measured in bridges using ratios from 10:1 to 1000:1 against the Welwyn resistors. Remaining decade values are measured in bridges using ratios of 10:1 and 100:1 against 1 to 2 1000 billion ohm resistors, previously compared with the 1 billion ohm standard. Author (ESA)

N85-33292# Los Alamos National Lab., N. Mex.
CONCEPTUAL DESIGN AND ANALYSIS OF HIGH-SPEED ELECTRONIC IMAGING
R. R. Brown and J. R. Parker Nov. 1984 51 p refs Sponsored in part by DOD
(Contract W-7405-eng-36)
(LA-10072-MS) Avail: NTIS HC A04/MF A01

The feasibility of using electronic imaging technology for aeroballistics research was examined. Electronic imaging devices are analyzed with respect to range system characteristics. Optical imaging and illumination parameters in the existing system are defined and quantified. System imaging capability is measured and described by modern imaging systems analysis in terms of the system response to a step function input. Two independent measurements that determine system illumination parameters are described, and supporting analysis is included. Concepts critical to data analysis are discussed, along with a survey of available hardware that will image and process projectile flight path data.
E.A.K.

N85-33293*# Hughes Aircraft Co., Torrance, Calif. Microwave Products Div.
SIXTY GHz IMPATT DIODE DEVELOPMENT Final Report, Nov.

1981 - Feb. 1985
Y. E. Ma, J. Chen, E. Benko, M. J. Barger, H. Nghiem, T. Q. Trinh, and J. Kung May 1985 180 p refs
(Contract NAS3-23253)
(NASA-CR-174969; NAS 1.26:174969; W-45797) Avail: NTIS HC A09/MF A01 CSCL 09C

The objective of this program is to develop 60 GHz GaAs IMPATT Diodes suitable for communications applications. The performance goal of the 60 GHz IMPATT is 1W CW output power with a conversion efficiency of 15 percent and 10 year life time. During the course of the program, double drift (DD) GaAs IMPATT Diodes have been developed resulting in the state of the art performance at V band frequencies. A CW output power of 1.12 W was demonstrated at 51.9 GHz with 9.7 percent efficiency. The best conversion efficiency achieved was 15.3 percent. V band DD GaAs IMPATTs were developed using both small signal and large signal analyses. GaAs wafers of DD flat, DD hybrid, and DD Read profiles using molecular beam epitaxy (MBE) were developed with excellent doping profile control. Wafer evaluation was routinely made by the capacitance versus voltage (C-V) measurement. Ion mass spectrometry (SIMS) analysis was also used for more detailed profile evaluation. B.W.

N85-33294*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
EVALUATION OF SEMICONDUCTOR DEVICES FOR ELECTRIC AND HYBRID VEHICLE (EHV) ac-DRIVE APPLICATIONS, VOLUME 2 Final Report
F. C. Lee, D. Y. Chen, M. Jovanic, and D. C. Hopkins 1 May 1985 431 p Prepared for JPL, Pasadena, Calif.
(Contract NAS7-100)
(NASA-CR-176103; NAS 1.26:176103) Avail: NTIS HC A19/MF A01 CSCL 09C

Test data of switching times characterization of bipolar transistors, of field effect transistor's switching times on-resistance and characterization, comparative data of field effect transistors, and test data of field effect transistor's parallel operation characterization are given. Data is given in the form of graphs. R.J.F.

N85-33295# Oregon State Univ., Corvallis. Technical Planning and Development Group.
QUARTER-INCH STREAMING TAPE DRIVE APPLICATION WITH THE SERIAL ASCII INSTRUMENTATION LOOP (SAIL) SYSTEM
R. S. Mesecar and W. Dillon May 1985 56 p
(Contract N00014-84-C-0218)
(AD-A155354; TP/D-85-8) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report describes a bulk-data recorder based on the integration of a 1/4-inch streaming magnetic tape drive with interface circuitry to the Serial ASCII Instrumentation Loop (SAIL) concept. The development capitalizes on newly implemented industry standards for electronic interfacing to the tape drive and standards for data formatting on the tape. As the capability of this recording media becomes more apparent to the user, it should help resolve some of the issues dealing with methods and recording media for effectively moving digitized data in the marine community. GRA

N85-33296# Illinois Univ., Urbana. Coordinated Science Lab.
MODULATION DOPED GaAs/Al(x)Ga(1-x)As LAYERED STRUCTURES WITH APPLICATIONS TO FIELD EFFECT TRANSISTORS Annual Report, 1 Jan. - 31 Dec. 1984
H. Morkoc 1 Mar. 1985 204 p
(Contract F49620-83-K-0021)
(AD-A155360; AFOSR-85-0468TR) Avail: NTIS HC A10/MF A01 CSCL 20/12

Traditionally, there have been two approaches to achieving high switchings speeds in semiconductor devices. One is to improve processing and lithographic techniques thereby reducing device dimensions and reducing parasitic losses. The other is to fabricate devices from material with improved transport properties such as GaAs or InP as opposed to Si. With the advent of epitaxial techniques which can grow thin reproducible heterolayer structures on substrates large enough for LSI and VLSI application, devices which employ conduction band engineering to improve device performance are becoming strong contenders in the race for faster devices. Examples of devices which have been improved by conduction band engineering are heterojunction lasers, heterojunction bipolar transistors junction field effect transistors and metal semiconductor field effect transistor (MESFETS). In the aforementioned structures conduction and valence band discontinuities at the heterojunction are used to confine carriers to the active region of the device and/or reduce parasitic currents. A modulation doped heterostructure (MDH), on the other hand, is employed to actually improve or enhance the transport properties of the majority carriers in the channel of a MESFET. In a modulation doped (Al, Ga)As/GaAs heterostructure only the larger bandgap (Al, Ga)As is doped (n-type). GRA

N85-33297# Creative Optics, Inc., Bedford, Mass.
EFFECTS OF HYDROMETEORS ON ELECTROMAGNETIC WAVE PROPAGATION Final Report, Jun. - Dec. 1984
J. F. Ebersole, W. K. Cheng, J. Hallett, and R. G. Hohlfeld Jan. 1985 80 p
(Contract F19628-84-C-0115)
(AD-A155379; COI-SR-15; AFGL-TR-84-0318) Avail: NTIS HC A05/MF A01 CSCL 20/14

Attenuation of electromagnetic (EM) waves by Hydrometers such as rain, snow, clouds, and fog, can cause serious degradation of EM wave systems. This report describes such attenuation of radio waves to X-rays, with primary applications to communications in the microwave and millimeter wave portions of the EM spectrum. GRA

N85-33298# Department of the Air Force, Washington, D.C.
METHOD OF CHARACTERIZING CRITICAL TIMING PATHS AND ANALYZING TIMING RELATED FAILURE MODES IN VERY LARGE SCALE INTEGRATED CIRCUITS Patent Application
D. J. Burns, inventor (to Air Force) Filed 28 Mar. 1985 70 p
(AD-D011731; US-Patent-Appl-SN-716863) Avail: NTIS HC A04/MF A01 CSCL 09/5

A method characterizes critical timing paths and analyzing timing related failure modes in high clock rate photocurrent at the drain of a single transistor in a very large scale integrated circuit. The laser testing apparatus utilized with the method of this invention incorporates therein a laser having its output beam focused onto the drain junction of the transistor under test. The localized injection of electromagnetic radiation produces a photocurrent at the drain junction at specific times during the testing procedure which increases the logic level transition times associated with that particular node. This causes an increase in the minimum operating power supply and/or a decrease in the maximum operating frequency at which the microcircuit will properly function. Consideration of these parameters and the level of photocurrent provide a measurement related to the worst case timing margin which occurs during functional test of the integrated microcircuit. GRA

N85-33299# Department of the Air Force, Washington, D.C.
ELECTROCHROMIC DISPLAY DEVICE Patent Application
M. M. Nicholson, inventor (to Air Force) Filed 19 Jul. 1984 35 p
(AD-D011733; US-Patent-Appl-SN-632179) Avail: NTIS HC A03/MF A01 CSCL 07/1

This invention relates to electrochromic devices. In one aspect it relates to electrically controllable display devices. In another aspect it relates to electrically tunable optical or light filters. In yet another aspect it relates to a chemical sensor device which employs a color changing film. There are many uses for electrically controllable display devices. A number of such devices have been in commercial use for some time. These display devices include liquid crystal displays, light emitting diode displays, plasma displays, and the like. Light emitting diode displays and plasma display panels both suffer from the fact that they are active. Light emissive devices which require substantial power for their operation, In addition, it is difficult to fabricate light emitting diode displays in a manner which renders them easily distinguishable under bright ambient illumination. Liquid crystal displays suffer from the

disadvantage that they are operative only over a limited temperature range and have substantially no memory within the liquid crystal material. GRA

N85-33300# Department of Energy, Washington, D. C.
BATTERYLESS MAGNETO-DRIVEN PORTABLE RADIAC Patent Application
D. A. Waechter, G. O. Bjarke, F. Trujillo, M. A. Wolf, and C. J. Umbarger, inventors (to DOE) 19 Oct. 1984 25 p
(Contract W-7405-eng-36)
(DE85-011622; US-Patent-Appl-SN-662656) Avail: NTIS HC A02/MF A01

A hand-powered alternator for generating an alternating voltate which provides same through a rectifier to a high capacity which stores the resultant dc voltage and drives a voltage regulator to provide a constant low voltage output for a portale radiation detection instrument is discussed. The instrument includes a Geiger-Mueller detector tube whose output is fed to a pulse detector and then through an event counter and LCD driver circuit to an LCD bar graph for visual display. An audio driver and an audio output is also provided. All circuitry used is low power so that the capacitor can be readily charged to a sufficient level to provide power for at least 30 minutes. A low voltage indicator is provided on the LCD display to indicate the need for manual recharging. DOE

N85-33301# Department of Energy, Washington, D. C.
QUANTITATIVE DETERMINATION OF MINERAL COMPOSITION BY POWDER X-RAY DIFFRACTION Patent Application
G. A. Pawloski, inventor (to DOE) (California Univ., Livermore. Lawrence Livermore Lab.) Filed 10 Aug. 1984 16 p
(Contract W-7405-eng-48)
(DE85-011654; US-Patent-Appl-SN-639287) Avail: NTIS HC A02/MF A01

An external standard intensity ratio method is used for quantitatively determining mineralogic compositions of samples by X-ray diffraction. The method uses ratios of X-ray intensity peaks from a single run. Constants are previously determined for each mineral which is to be quantitatively measured. Ratios of the highest intensity peak of each mineral to be quantified in the sample and the highest intensity peak of a reference mineral contained in the sample are used to calculate sample composition. DOE

N85-33302# Department of Energy, Washington, D. C.
THERMOELECTRIC GENERATOR AND METHOD FOR THE FABRICATION THEREOF Patent Application
D. K. Benson and C. E. Tracy, inventor (to DOE) Filed 1 Aug. 1984 23 p
(Contract DE-AC02-83CH-10093)
(DE85-011650; US-Patent-Appl-SN-636751) Avail: NTIS HC A02/MF A01

A thermoelectric generator using semiconductor elements for responding to a temperature gradient to produce electrical energy with all of the semiconductor elements being of the same type is disclosed. A continuous process for forming substrates on which the semiconductor elements and superstrates are deposited and a process for forming the semiconductor elements on the substrates are also disclosed. The substrates with the semiconductor elements thereon are combined with superstrates to form modules for use as thermoelectric generators. DOE

N85-33303# Department of Energy, Washington, D. C.
SOLID STATE RADIATIVE HEAT PUMP Patent Application
P. H. Berdahl, inventor (to DOE) (California Univ., Berkeley. Lawrence Berkeley Lab.) Filed 28 Sep. 1984 30 p
(Contract DE-AC03-76SF-00098)
(DE85-011605; US-Patent-Appl-SN-655500) Avail: NTIS HC A03/MF A01

A solid state radiative heat pump operable at room temperature (300 K) is described. It utilizes a semiconductor having a gap energy in the range of 0.03 to 0.25 eV and operated reversibly to produce an excess or deficit of change carriers as compared equilibrium. In one form of the invention an infrared semiconductor photodiode is used, with forward or reverse bias, to emit an excess or deficit of infrared radiation. Three methods of enhancing transmission of radiation the active surface of the semiconductor are disclosed. In one method, an anti-reflection layer is coated into the active surface of the semiconductor, the anti-reflection layer having an index of refraction equal to the square root of that of the semiconductor. In the second method, a passive layer is spaced from the active surface of the semiconductor by a submicron vacuum gap, the passive layer having an index of refractive equal to that of the semiconductor. In the third method, a coupler with a paraboloid reflecting urface is in contact with the active surface of the semiconductor, the coupler having an index of refraction abosut the same as that of the semiconductor. DOE

N85-33304# Department of Energy, Washington, D. C.
PRECISION LINEAR RAMP FUNCTION GENERATOR Patent Application
W. B. Jatko (ORNL), D. R. McNeilly (ORNL), and L. H. Thacker, inventors (to DOE) (ORNL) Filed 1 Aug. 1984 9 p
(Contract DE-AC05-84OR-21400)
(DE85-011647; US-Patent-Appl-SN-636657) Avail: NTIS HC A02/MF A01

A ramp function generator is provided which produces a precise linear ramp function which is repeatable and highly stable. A derivative feedback loop is used to stabilize the output of an integrator in the forward loop and control the ramp rate. The ramp may be started from a selected baseline voltage level and the desired ramp rate is selected by applying an appropriate constant voltage to the input of the integrator. DOE

N85-33305# Department of Energy, Washington, D. C.
ELECTRON BEAM ENHANCED SURFACE MODIFICATION FOR MAKING HIGHLY RESOLVED STRUCTURES Patent Application
J. R. Pitts, inventor (to DOE) Filed 10 Oct. 1984 31 p
(Contract DE-AC02-83CH-10093)
(DE85-011609; US-Patent-Appl-SN-659490) Avail: NTIS HC A03/MF A01

A method for forming high resolution submicron structures on a substrate is provided by direct writing with a submicron electron beam in a partial pressure of a selected gas phase characterized by the ability to dissociate under the beam into a stable gaseous leaving group and a reactant fragment that combines with the substrate material under beam energy to form at least a surface compound. Variations of the method provide semiconductor device regions on doped silicon substrates, interconnect lines between active sites, three dimensional electronic chip structures, electron beam and optical read mass storage devices that may include color differentiated data areas, and resist areas for use with selective etching techniques. DOE

N85-33306# Department of Energy, Washington, D. C.
MAGNETICALLY INSULATED DIODE FOR GENERATING PULSED NEUTRON AND GAMMA RAY EMISSIONS Patent Application
G. W. Kuswa (Sandia Lab., Albuquerque, N. Mex.) and R. J. Leeper, inventors (to DOE) (Sandia Lab., Albuquerque, N. Mex.) Filed 16 Aug. 1984 32 p
(Contract DE-AC04-76DP-00789)
(DE85-011658; US-Patent-Appl-SN-641225) Avail: NTIS HC A03/MF A01

A magnetically insulated diode employs a permanent magnet to generate a magnetic insulating field between a spaced anode and cathode in a vacuum. An ion source is provided in the vicinity of the anode and used to liberate ions for acceleration toward the cathode. The ions are virtually unaffected by the magnetic field and are accelerated into a target for generating a nuclear reaction. The ions and target material may be selected to generate either neutrons or gamma ray emissions from the reaction of the accelerated ions and the target. In another aspect of the invention, a field coil is employed as part of one of the electrodes. A plasma prefill is provided between the electrodes prior to the application of a pulsating potential to one of the electrodes. The

field coil multiplies the applied voltage for high diode voltage applications. The diode may be used to generate a 7 Li(p, GAMMA)8BE reaction to produce 16.5 MeV gamma emission. DOE

N85-33307# Argonne National Lab., Ill.
IN-SITU OBSERVATIONS OF THE DEVELOPMENT OF HEAVY-ION DAMAGE IN SEMICONDUCTORS
M. L. Jenkins, T. J. Chandler, L. M. Robertson, and M. A. Kirk 1985 7 p Presented at the 4th Oxford Conf. on Microscopy of Semiconducting Mater., Oxford, 25 Mar. 1985 Submitted for publication
(Contract W-31-109-eng-38)
(DE85-010289; CONF-8503131-1) Avail: NTIS HC A02/MF A01

In situ observations on ion beam induced amorphisation of GaAs, GaP and Si are reported. Direct impact amorphisation was found to occur in GaAs irradiated with 100-keV Xe(+) ions to low doses at low temperature (approx. 40K) in contrast to previous room temperature irradiations. In GaP and in silicon, where heavy projectiles do cause direct impact amorphisation at room temperature, the evolution of the damage structure with ion dose was studied. The defect yield both in GaP irradiated with 100-keV Kr(+) ions and in Si irradiated with 100-keV Xe(+) ions was found to decrease monotonically with increasing dose over the dose range 10 to the 15th power to 10 to the 17th power ions m(-). DOE

N85-33308# California Univ., Berkeley. Lawrence Berkeley Lab.
CRITICAL CURRENT DENSITY AND MICROSTRUCTURAL STATE OF AN INTERNAL TIN MULTIFILAMENTARY SUPERCONDUCTING WIRE
D. R. Dietderich, J. Glazer, C. Lea, W. V. Hassenzahl, and J. W. Morris, Jr. Sep. 1984 15 p Presented at the Appl. Superconductivity Conf., San Diego, Calif., 9 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-009966; LBL-18654; CONF-840937-29) Avail: NTIS HC A02/MF A01

The critical current density (J sub c) of internal tin wires is increased when low-temperature diffusion heat treatments are performed prior to a high temperature reaction. To determine the variation of J sub c with prereaction heat treatments a copper-stabilized IGC internal tin wire with an outside diameter of 0.267mm was studied. The wire has 2 to 2.5 micron diameter filameters, and within the Ta barrier, the area ratio of the copper matrix and Sn core to Nb is about 2.2. Due to the character of the Cu-Sn phase diagram, heat treatments at a series of temperatures below the Nb3Sn reaction temperature affect the local Sn concentration in the matrix about the Nb filaments. The variation in J sub c resulting from these heat treatments is a consequence of the microstructural state of the conductor and the morphology of the Nb3Sn layer produced. The results of this work show that the internal tin and bronze-processed wires have different J sub c (H) characteristics. The two processes have comparable critical currents at high fields, suggesting the same H sub c2, while at low fields the internal tin wire is superior, suggesting a better grain morphology. DOE

N85-33309# Westinghouse Electric Corp., Baltimore, Md.
HIGH-POWER SOLID-STATE RF SOURCE FOR ACCELERATOR CAVITIES
D. R. Vaughan, G. E. Mols, D. W. Reid, and J. M. Potter 1985 4 p Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012672; LA-UR-85-1605) Avail: NTIS HC A02/MF A02

During the past few years the Defense and Electronics Center of Westinghouse Electric Corporation has developed a solid state, 250 kW peak, RF amplifier was developed for use with SPS-40 radar system. This system has a pulse length of 60 (MU)s and operates across the frequency band from 400 to 450 MHz. Because of the potential use of such a system as an RF source for accelerator applications, a collaborative experiment was initiated between Los Alamos National Laboratory and Westinghouse to simulate the resonant load conditions of an accelerator cavity. This paper describes the positive results of that experiment as well as the solid state amplifier architecture. It also explores the future of high power, solid state amplifiers as RF sources for accelerator structures. DOE

N85-33310# Department of Energy, Washington, D. C.
TRANSPARENT ELECTRODE FOR OPTICAL SWITCH Patent Application
J. Goldhar and M. A. Henesian, inventors (to DOE) Filed 19 Oct. 1984 20 p Prepared in cooperation with LLL
(Contract W-7405-eng-48)
(DE85-011618; US-Patent-Appl-SN-662641) Avail: NTIS HC A02/MF A01

The invention relates generally to optical switches and techniques for applying voltage to an electro-optical crystal, and more particularly, to transparent electrodes for an optical switch. System architectures for very large inertial confinement fusion (ICF) lasers require active optical elements with apertures on the order of one meter. Large aperture optical switches are needed for isolation of stages, switch-out from regenerative amplifier cavities and protection from target retroreflections. Author

N85-33311# Department of Energy, Washington, D. C.
INTEGRATED CURRENT COLLECTOR AND CATALYST SUPPORT Patent Application
L. J. Bregoli, inventor (to DOE) Filed 17 Oct. 1984 17 p
(Contract DE-AC21-79ET-15440)
(DE85-011616; US-Patent-Appl-SN-661851) Avail: NTIS HC A02/MF A01

An integrated current collecting electrode for a molten carbonate fuel cell includes a corrugated metal conductive strip positioned in contact with a catalyst layer. The corrugations of the metal strip form a plurality of gas channels immediately adjacent to the surface of the catalyst through which a reactant gas flows. Each channel is filled with a particulate material to maintain separation between the metal strip and the catalyst in ensuring gas channel integrity. The catalyst may be in the form of a compacted, particulate material provided the particle size of the material within the gas channels is larger than that of the catalyst particles to prevent catalyst migration to the metal conductor and provide reactant gas access to the catalyst layer. The gas channels formed by the corrugations of the metal strip are arranged in an offset pattern along the direction of gas flow for improved reactant gas distribution to the catalyst layer. The particulate material positioned within the gas flow channels may be a ceramic conductor such as a perovskite or a spinel for enahanced current collection. DOE

N85-33312# Department of Energy, Washington, D. C.
SWITCHING POWER SUPPLY Patent Application
A. M. Mihalka, inventor (to DOE) Filed 5 Jun. 1984 39 p
(Contract W-7405-eng-48)
(DE85-005993; US-Patent-Appl-SN-617651) Avail: NTIS HC A03/MF A01

The invention is a repratable capacitor charging, switching power supply. A ferrite transformer steps up a dc input. The transformer primary is in a full bridge configuration utilizing power MOSFETs as the bridge switches. The transformer secondary is fed into a high voltage, full wave rectified whose output is connected directly to the energy storage capacitor. The transformer is designed to provide adequate leakage inductance to limit capacitor current. The MOSFETs are switched to the variable frequency from 20 to 50 MHz to charge a capacitor from 0.6 kV. The peak current in a transformer primary and secondary is controlled by increasing the pulse width as the capacitor charges. A digital ripple counter counts pulses and after a preselected desired number is reached an up counter is clocked. DOE

N85-33313# Sandia Labs., Albuquerque, N. Mex.
MODEL THAT PREDICTS PULSE CHARGED GAS SWITCHING BREAKDOWN PHENOMENA
T. H. Martin 1985 44 p refs Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)

(DE85-013119; SAND-84-2523C; CONF-850616-21) Avail: NTIS HC A03/MF A01

Pulsed power switching data is used to develop a new model of gas switching. The extended model explains such diverse phenomena as prefire probabilities, breakdown voltages, triggered switching delays, triggered breakdown mechanisms, and effects of electrode surface finish on gap breakdown in pulse-charged switches. DOE

N85-33314# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING Abstracts Only
23 Nov. 1984 79 p Transl. into ENGLISH from various Russian articles
(JPRS-UEE-84-015) Avail: NTIS HC A05/MF A01

Various topics in electronics and electrical engineering are discussed. Signal processing, radar targets, antennas, fiber optics, transistor circuits, and electromagnetic compatibility are among the topics discussed. For individual titles, see N85-33315 through N85-33380.

N85-33315# Joint Publications Research Service, Arlington, Va.
SIGNAL PROCESSING IN QUASI-HOLOGRAPHIC SYSTEM AS AN INVERSE PROBLEM Abstract Only **c35**
B. S. Mush and L. S. Altman *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 1 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1242-1251 Original language document was announced in IAA as A84-43177 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A quasi-holographic system is defined formally as a system executing the processing of signals in the case of the solution of inverse problems described by Fredholm equations of the first kind with finite difference kernels whose effective width decreases as their spectrum width when a certain function of the integral equation is determined on a bounded interval. A regularized solution to the system of integral equations is obtained. The concept of the specific number of operations required in obtaining this solution is defined, and the existence of a minimum value of the specific number of operations required during multistep processing is demonstrated. Particular consideration is given to the minimization of the number of operations when using the direct method and the convolution method based on the FFT to calculate weighted sums in the case of a linear-FM signal. B.J.

N85-33316# Joint Publications Research Service, Arlington, Va.
METHOD OF STATIC MEASUREMENTS OF ABSOLUTE SCATTERING MATRIX OF RADAR TARGETS Abstract Only **c32**
S. N. Polikarpov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 2 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 31-33 Original language document was announced in IAA as A84-38754 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The present study gives a theoretical justification of a method of statistical measurements of the absolute S-matrix of radar targets which is based on the identification of the measurement system using linear regression and the least squares method. This method is more general than the direct method and is therefore free of many of the limitations of the latter. This makes it possible to significantly simplify the construction and adjustment of the measuring instrumentation and to employ arbitrary polarizations in the measurements, irrespective of the bases in which the absolute S-matrices are to be obtained. B.J. (IAA)

N85-33317# Joint Publications Research Service, Arlington, Va.
SELECTIVITY OF WEIGHT COMPENSATOR OF PASSIVE INTERFERENCE TO UNKNOWN VELOCITIES OF DETECTABLE TARGETS Abstract Only
A. Z. Kiselev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 3 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 33-36 Original language document was announced in IAA as A84-38755 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Attention is given to a compensator for the detection of targets with unknown velocities. A weight vector is obtained which describes the matching of the compensator with the range of expected target velocities, and the selectivity features of this compensator are investigated. It is shown that, for a larger number of processed pulses, the compensator selects only targets whose Doppler frequencies are close to half the repetition frequency of the radar signals. B.J.

N85-33318# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE RADIO DIRECTION FINDER WITH ELECTRONICALLY STABILIZED RADIATION PATTERN Abstract Only
A. S. Bogachev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 3-4 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 37-41 Original language document was announced in IAA as A84-38756 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The Markov theory of optimal nonlinear filtering in the first-order Gaussian approximation is used to synthesize, in analog and digital versions, a quasi-optimal complex onboard radio direction finder with electronic stabilization of the antenna-array directivity diagram. It is shown that the application of the proposed processing algorithm is most suitable for direction finders with arrays having a narrow diagram, since in many cases it is impossible to implement the tracking mode without additional information about the angular position of the flight vehicle. B.J.

N85-33319# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF DIGITAL RANGE FINDER WITH STROBOSCOPIC DISCRETIZATION Abstract Only
D. V. Nezlin and M. S. Chernyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 4 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 44-46 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

In digital range finders for detection of moving targets it is often necessary to lower the discretization frequency and thus to increase the speed of measurements without decreasing the accuracy and without additional equipment complexity. One method of achieving this is by stroboscopic discretization, which involves shifting the signal samples taken in successive periods of probing pulses by a time interval delta t = T sub i/n N (n being the number of discretization pulses per signal pulse of duration Ti during each one of N tracking periods). For a nontracking digital range finder of a pulse radar, the error of measuring the time position of the pulse center depends not only on the number of readings but also on the voltage waveform at the range finder input, this waveform varying from triangular in the case of an exactly matched preceding stage to almost rectangular in the case of complete mismatch. A comparative analysis of stroboscopic and conventional discretization by computer simulation with a typical number of N tracking periods and a 20 dB signal-to-noise ratio at the range finder input revealed that stroboscopic discretization reduces the error of range measurement appreciably when the number of discretization pulses per signal pulse is smaller than the number of reading which ensures a sufficiently small error with conventional discretization. R.J.F.

N85-33320# Joint Publications Research Service, Arlington, Va.
AMPLITUDE STABILIZATION OF PULSE SIGNALS Abstract Only
Yu. M. Korshunov and A. V. Simkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 5 Transl. into ENGLISH from Radiotekn. (Moscow), no. 5, May 1984 p 92 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A digital amplitude stabilizer is considered for pulses with unknown timing, with slowly varying multiplicative interference and

with high frequency additive interference. The stabilization problem is solved by method of minimum mean-square error. An analog amplitude stabilizer is also constructed, for comparison. Author

N85-33321# Joint Publications Research Service, Arlington, Va.
VATRA TELEVISION COMPLEX FOR SALYUT ORBITAL SPACE STATION Abstract Only c17
Ya. G. Brativnk, D. P. Brilliantov, and V. V. Movchan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 5 Transl. into ENGLISH from Tekhn. Kino Televideniya (Moscow), no. 6, Jun. 1984 p 3-5 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Early spacecraft had one-way TV systems but increased information and astronaut psychological support needs in long flights, including contacts with friends and relations on the ground, led to the development of the two way Vatra system for Salyut-6 spacecraft. The system was improved during three long Salyut-6 expeditions, and the forth trip utilized a variant with an optical telecamera adaptor for observing the dark side of the Earth as well as stars and galaxies in the infrared range. The design objectives are compactness, reliability and minimal energy consumption and mass. Silicon solar batteries are the energy source supplying around 0.7 W per square decimeter of illuminated surface. Spacecraft voltage goes from 34 to 23 V when it passes into the unilluminated zone. The complex consists of a switch unit, portable videorecorder, TV camera, monitor (with 23 cm diagonal picture tube), and acoustic system and a TV transmitter and receiver. The complex can take images and display, transmit and receive either live or on tape. It has been repeatedly tested and found adequate. Author

N85-33322# Joint Publications Research Service, Arlington, Va.
POTENTIAL COORDINATE ESTIMATE ACCURACY ESTIMATION ACCURACY BY MULTIPOSITION RADAR SYSTEMS Abstract Only c32
A. I. Kremer *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1322-1329 Original language document was announced in IAA as A84-43188 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Correlation matrices of joint target-coordinate estimates are obtained for the optimal spatial-temporal processing of signals in coherent and video-coherent multistatic radar systems (MRSs). Joint and separate estimates of the range and angular coordinate of the target are compared for both types of MRSs in terms of potential accuracy. Attention is given to the general case encompassing active location in the far field, the Fresnel zone, and the near field of the MRS. It is shown that video-coherent systems are less accurate than coherent systems (especially when measuring the angular coordinate) even in the case of high SNRs at the receiving points. B.J.

N85-33323# Joint Publications Research Service, Arlington, Va.
OPTIMAL COMPLEX NONLINEAR PROCESSING OF CONTINUOUS AND PULSED SIGNALS Abstract Only c32
M. S. Yarlykov, M. A. Mironov, and V. S. Artemenkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 6 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1330-1338 Original language document was announced in IAA as A84-43189 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The Markov theory of optimal nonlinear filtering is used to obtain quasi-optimal algorithms for the complex nonlinear processing of pulsed and continuous random signals. These algorithms combine algorithms for the nonlinear estimation of continuous processes and for the estimation of the parameters of pulsed signals. As an example, attention is given to the synthesis of the structural scheme of an optimal complex rangefinder, and its accuracy and noise immunity are quantitatively assessed.
B.J. (IAA)

N85-33324# Joint Publications Research Service, Arlington, Va.
DETECTION OF SIGNALS FROM COHERENT PULSED RADARS WITH RANDOM VARIATION IN PARAMETERS OF SOUNDING SIGNALS FROM PULSE TO PULSE AGAINST BACKGROUND OF WORST-CASE GAUSSIAN NOISE Abstract Only c32
V. V. Rodionov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 7 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1339-1346 Original language document was announced in IAA as A84-43190 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The structure and detection characteristics of coherent pulsed radars with random variation in the carrier frequency, initial phase and time-axis position of each pulse burst are investigated. A method is presented for finding the weight function of an optimal receiver and the signal-to-noise ratio at its output. The method can be used to investigate noise tolerance characteristics and to find the optimum receiver structure for variation in any of the parameters of the sounding signals, either separately or together. It is found that the signal-to-noise ratio and receiver structure remain unchanged if the condition of Gaussian noise is eliminated, because only the correlation functions of these processes are used. Author

N85-33325# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF ADAPTIVE FILTERS FOR TRACKING RADIO SYSTEMS Abstract Only c32
A. M. Shloma and S. M. Frolov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 7 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1379-1384 Original language document was announced in IAA as A84-43195 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A fiducial approach is used to examine the problem of synthesizing optimal filters of radio tracking systems in conditions of a priori indeterminacy. Invariant randomized estimates of the unknown parameters are used to obtain closed recursive algorithms of adaptive filtering in discrete time. B.J.

N85-33326# Joint Publications Research Service, Arlington, Va.
DIGITAL HOLOGRAPHIC SYNTHESIS OF PATTERN-FORMING TRANSPARENCIES FOR RING ANTENNA ARRAYS Abstract Only c32
A. Yu. Grinev, L. P. Yaroslavskiy, N. S. Merzlyakov, V. S. Temchenko, and Ye. N. Voronin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 8 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1266-1273 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Digital holographic methods are described for synthesizing the pattern-forming transparency employed in the coherent optical processor of ring antenna arrays performing parallel azimuth and frequency scanning at fixed elevations. The structure of the pattern-forming transparency is analyzed, and the digital holographic transparency recording is described. The results of experimentation with the coherent optical processor of a ring array are presented. The findings confirm the possibility of replacing digital processors with coherent optical processors for handling the signals produced by ring (cylindrical) antenna arrays. Author

N85-33327# Joint Publications Research Service, Arlington, Va.
VARIATION IN RADIOWAVE PROPAGATION CONDITIONS IN CORONA DURING SOLAR ACTIVITY CYCLE Abstract Only c92
A. I. Yefimov, O. I. Yakovlev, V. K. Shtrykov, and V. I. Rogalskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 8-9 Transl. into ENGLISH from Radiotekhn. i Electron. (Moscow), v. 29, no. 7, Jul. 1984 p 1274-1279 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Observations of signals from space vehicles are analyzed in

order to identify long-term changes in radio wave propagation conditions in the plasma near the Sun and the factors underlying these changes. It is found that there are long-term changes in propagation conditions with periods of several years, in addition to short-term variations with characteristic times of 5 to 20 days. These changes are caused by variations in the density of the plasma flux in the path of the radio waves. As the electron concentration increases so do the irregularities in the index of refraction, which cause increased radio wave scattering and increased amplitude and phase fluctuations, as well as broadening of the spectral line. Author

N85-33328# Joint Publications Research Service, Arlington, Va.
ADAPTIVE SYNTHESIS OF ANTENNAS WITH SEPARATION OF SIGNALS BY DIRECTION OF ARRIVAL Abstract Only c32
F. L. Ayzin and B. L. Kozan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 9 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1306-1315 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A model is developed of an adaptive procedure for synthesizing an antenna with signal separation by direction of arrival, which employs phase processing in the aperture of a phase array. The model makes it possible to identify the basic regularities in the relationship between the rate of convergence, and the signal division efficiency, as a function of the parameters of the algorithm and the device which implements the processing. The model is helpful during the initial stage of the synthesis, because it makes it possible to reduce the region in which the optimizing parameters are sought. The modeling of an adaptive processing of reducing the directivity pattern level in the direction of the source of an interferring signal for a 200-element flat switched phased array is presented as an example. Author

N85-33329# Joint Publications Research Service, Arlington, Va.
COMPARATIVE CHARACTERISTICS OF OPTICAL MULTIPOSITION PULSE SIGNALS WITH INTERSYMBOL DISTORTION Abstract Only c32
M. E. Gavlin and V. I. Yemin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 10 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 11-16 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The performance of fiber optics in a receiver-amplifier channel transmitting optical multiposition pulse signals is comparatively evaluated in terms of the signal-to-noise ratio at any given instant of time. As a basic receiver, one is considered which consists of a photodetector, a resistive-capacitive load, a wideband amplifier and a threshold device. The statistical characteristics of detection are calculated, using the waveform of a one-electron input pulse as a reference and extending the relations to a Gaussian binary signal with a conditionally Poissonian noise of intersymbol interference. An analysis of the dependence of the signal intensity or signal-to-noise ratio on the receiver bandwidth and the duration of the equivalent square pulse (having the same area as the Gaussian pulse and an amplitude corresponding to the maximum value) reveals the existence of a threshold associated with fluctuation of the random interference intensity. It also reveals a decrease of the signal-to-noise ratio with an increasing bandwidth within the linear range of the characteristics, which is attributable to a decrease of the mean signal intensity in a manner typical of optical signals as well as to inadequacy of single readouts. R.J.F.

N85-33330# Joint Publications Research Service, Arlington, Va.
REFRACTION OF NARROW PROBING LIGHT BEAM IN MULTILAYER OPTICAL FIBER Abstract Only c74
S. D. Mirovitskaya and D. L. Kudryavtsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 11 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 73-76 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

For an experimental design and performance evaluation of optical fibers, it is necessary to establish an analytical relation between the refraction angle of a probing light beam and the geometrical parameters of the fiber. Here the problem is solved by application of Snell's law for a narrow light beam, first to a double-layer fiber consisting of a gradient core inside a homogeneous sheath and then to a triple-layer fiber consisting of a gradient core inside a double-layer sheath. Author

N85-33331# Joint Publications Research Service, Arlington, Va.
TEMPERATURE SENSITIVITY OF FIBER-OPTIC TRANSMISSION LINE Abstract Only c74
F. A. Shatalov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 11 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 76-80 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The temperature sensitivity of multilayer fiber-optic transmission lines with a power-law profile of the refractive index is evaluated in two ways: (1) with temperature and strain components in the core as the independent variables; and (2) with temperature and stress components in the core as the independent variables. The relations for the temperature coefficient of the refractive index at zero strain or at zero stress, respectively, yield in each case the corresponding condition for temperature insensitivity (zero temperature coefficient of the refractive index.) For fibers with small numerical aperture it is assumed that the Poisson ratio varies insignificantly while the Young modulus and the coefficient of thermal expansion vary linearly with the refractive index as a function of the radial coordinate in the fiber core. The accuracy of this approximation is checked against experimental data and found to be satisfactory for three-, four-, five-layer fibers. The results are applicable to fiber materials with positive thermooptical coefficient of stress and large coefficient of thermal expansion. R.J.F.

N85-33332# Joint Publications Research Service, Arlington, Va.
DEPTH DIMENSION COMPRESSION OF 3-D IMAGES Abstract Only c35
N. K. Ignatyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 12 Transl. into ENGLISH from Tekhn. Kino Televideniya (Moscow), no. 6, Jan. 1984 p 5-10 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

As holography develops, there is renewed interest in noncoherent light photography including possibilities for three-dimensional views utilizing the parallax-paneramogram method in which the lenticular grating carrier of the fixed image has a limited depth of resolution of approximately 10% of the distance of the scene. This principle was used to develop a method of noncoherent parallax-panoramogram photography with depths extending from close to the camera to unlimited distances. An optical scheme and the main formula are presented for the compression and range effects. Compression is considered from the point of view of comparison of image parameters with the fixed image and it is shown that the compressed 3-D image does not distort the original. This method can be used for holographic rerecording and can thus extend the possibilities for noncoherent photography with holographic applications. Author

N85-33333# Joint Publications Research Service, Arlington, Va.
LI481 AND LI482 VIDICONS FOR TWO-TUBE COLOR TV CAMERAS WITH IMPROVED IMAGE QUALITY Abstract Only
A. Ye. Gershberg, A. P. Golovina, Z. I. Kuzminova, G. I. Korshunova, A. S. Markizov, N. N. Mikhaylov-Teplov, and S. P. Nizhegorodov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 15 Transl. into ENGLISH from Tekhn. Kino Televideniya (Moscow), no. 6, Jan. 1984 p 39-41 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Two-tube color TV cameras are preferable to three-tube systems because they are smaller, require less power and have a simpler design, while operational characteristics are better than one-tube systems. At present, the 13-mm LI465-1 and LI472

vidicons are serially produced in the USSR. The first camera incorporating them was the Ts826. In the new system the 26 mm LI481 generates the green and the LI482 the blue and red components. A compound beam control system (electrostatic focussing and magnetic deviation) is used without a focussing coil, which reduced power needs and mass. One generator can be used for the two tubes. An optoelectronic crossed lens systems made it possible to use lower voltages than in comparable tubes. The photodiode targets are cadmium selenide for high sensitivity and good characteristics and fiber optical code filter discs give good transmission. The new system has improved resolution, signal-to-noise ratios and color quality. Author

N85-33334# Joint Publications Research Service, Arlington, Va.
NOISE IN STAGES AND IN INTERSTAGE COUPLINGS OF VARIOUS TRANSISTOR CIRCUITS Abstract Only
N. V. Terpugov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 17 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 23-27 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The overall noise level and the spectral noise power density are calculated or the design of high-sensitivity low-noise transistor devices on the basis of the equivalent noise generator and gamma-parameters corresponding to the three fundamental transistor circuit configurations: common-emitter, common-collector, common-base. The equations are first solved exactly and then approximately. It is indicated that the approximate solution yields the sought noise characteristics with a degree of accuracy adequate for engineering purposes. The method of calculations is easily extended to combinations of transistor stages such a common-emitter/common-emitter pair or a common-emitter/common-collector pair. E.A.K.

N85-33335# Joint Publications Research Service, Arlington, Va.
PROBABILISTIC ANALYSIS OF AUTOMATIC CONTROL SYSTEMS FOR DETECTION SYSTEMS Abstract Only
D. L. Kazakov, O. K. Shanayev, and V. N. Zhurakovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 17-18 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 36-37 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Automatic adaptive detection systems with digital signal processing, consisting of a threshold device and a digital decision device with a feedback loop which includes an n-bit reversible counter, a logic analyzer, an n-bit shift register, and a digital-to-analog converter are considered. For constructing the transfer probability graph, it is proposed to consider the main states and the complementary states of the shift register. The corresponding method to determine the elements of the transfer probability matrix PI is demonstrated on the case of $n=3$ and $k=1$. This method is shown to be applicable to probabilistic analysis of such systems with either stationary or nonstationary input processes, but the connectedness of the Markov chain must be accounted for and properly approximated to avoid unacceptable large errors. E.A.K.

N85-33336# Joint Publications Research Service, Arlington, Va.
HIGH-SPEED ADAPTATION ALGORITHM FOR HARMONIC CORRECTOR Abstract Only **c61**
V. S. Mikhalchan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 18 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 41-44 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A transversal filter of finite length acting as a harmonic corrector is used in various communication systems for compensation of linear intersymbol frequency distortion and an increase of the data transmission rate or channel capacity. An important factor is reducing the corrector adaptation time, which requires a special high-speed algorithm for regulating its controllable parameters. Such an algorithm can be constructed in accordance with the theory of computation complexity. A new second-order iterative algorithm for automatic tuning of the corrector with a sequence of single probing pulses is shown to be a fast converging one, capable of regulating the corrector parameters in approximately 25% less time than conventional second-order iterative algorithms. By assuming two levels of linear distortion in the transmission channel, it is adaptively tuned according to this algorithm and corresponding adaptation curves in as short a time as expected. E.A.K.

N85-33337# Joint Publications Research Service, Arlington, Va.
ADAPTIVE CORRECTOR OPERATING IN FREQUENCY DOMAIN Abstract Only
Ya. M. Radikaynen *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 19 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 47-49 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

An interference-immune corrector for a signal converter with automatic regulation of adaptation speed is described which operates in the frequency domain with fast convergence and high signal-to-noise ratio. It contains an analog-to-digital converter, a demodulator, and a filter array with equidistant spacing of center frequencies, three multipliers and two summators, as well as a reference signal generator, a frequency divider, a counter, and a noise meter. Filtering is done by a n-point Fourier transformation or bunching with a memory at the filter input followed by inverse Fourier transformation or debunching, respectively. The algorithm of corrector operation in the frequency domain can be constructed heuristically by an analog to the complex algorithm of minimizing the mean-square error in the time domain. Each weight factor can be processed independently and only once per Fourier transformation cycle, which ensures fast convergence without preliminary phase correction even with large distortions in the communication channel. E.A.K.

N85-33338# Joint Publications Research Service, Arlington, Va.
TRANSFORMATION OF SPECTRUM OF PHASE-CODE KEYED SIGNAL FOR SCANNING IN TIME Abstract Only
Ye. R. Maksimov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 19 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 60-61 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Use of phase-cycled keyed signals improves the time resolution of various radio engineering devices, combined correlation analysis and filtration being the optimum method of processing such signals. A technically simple way to scan such a signal in time is by shifting the clock frequency and correspondingly the phase in the reference signal relative to those in the received signal. The procedure is demonstrated mathematically for the important case of periodic keying with the multiplier in the receiver followed by an array of intermediate-frequency filters, because such a shifting gives rise to additional harmonic components symmetric with respect to the intermediate frequency in the spectrum. From the relation for the amplitude of the high-frequency voltage with a(sin x/x) envelope of the keying pulse sequence the maximum scan rate is obtained without loss of sensitivity at some given carrier frequency, this scan rate is equal to the difference between the keying pulse repetation rates in the received signal and in the reference signal, respectively. E.A.K.

N85-33339# Joint Publications Research Service, Arlington, Va.
DIGITAL MATCHED FILTER Abstract Only
Yu. V. Arzumanyan and A. Kh. Raykhlin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 20 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 82-83 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Synthesis of a digital passive filter with integrated microcircuits and rigid logic is shown which yields a matched device less intricate with fewer microcircuits than existing ones. The filter computes the correlation function of the input signal from 2N readings in a part of the input signal of 2T duration, which are stored in memories, and forms N-signal realization of duration-T differing from one

another by a shift per reading. Each of these N-realizations is multipled by a reference signal of duration T and the product is integrated, which yields the discrete correlation function of the input signal. The structure of such a digital matched filter includes two 2N-bit memories in push-pull, a commutator, a multiplier, a reference-signal generator, a summator with an accumulator-register, and a control module for read-in and read-out addressing as well as for driving the commutator and the reference-signal generator. A filter or an M-sequence of 511 elements with an 8-bit input signal requires only approximately 120 microcircuits in 256-bit memories. E.A.K.

N85-33340# Joint Publications Research Service, Arlington, Va.
HARDWARE REALIZATION OF DIGITAL FILTERS WITHOUT MULTIPLIERS Abstract Only **c61**
A. V. Brunchenko, Yu. S. Vlasyuk, and A. A. Ignatyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 20 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 83-86 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A method of constructing digital filters is proposed, elimination of multipliers is possible when there are only a few 1 elements in the code of coefficients. Multiplication is effected by a simple shift of the code through the corresponding number of digits in the direction of lesser significance. The hardware includes registers, multi(p)-input adders, sign reversers, shifters acting as 2-j multipliers, and a commutator in the form of an AND-OR logic element. The interconnections are determined by the algorithm, they can be designed for either parallel or sequential processing of signals. In both modes the speed is determined by the minimum repetition period of register synchronizing pulses and the latter is equal to three time delays: in a register, in an adder, and in the commutator. The output noise caused by the finite length of registers, assuming the errors of each source to be noncorrelated, has a zero mean and a dispersion which depends on whether rounding is done after the adders or after the registers. E.A.K.

N85-33341# Joint Publications Research Service, Arlington, Va.
DESIGN OF HIGH-ORDER ANALOG AND DIGITAL FILTERS WITH IDENTICAL SECTIONS Abstract Only **c61**
Yu. A. Grebenko, N. N. Savkov, and A. A. Semkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 21 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 87-90 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The method of synthesizing high-order active filters with identical functional components is extended to analog and digital filters. All sections are assumed to be canonical ones of the kind and with frequency characteristics corresponding to those of the composite device, their maximum transfer ratio is being equal to unity. The necessary calculations are facilitated by tables of parameters which yield the cutoff frequency, the center frequency, the pass or stop band, and the coefficients of the transfer function for low-pass, high pass, bandpass, and band elemination filters, all based on a low-pass prototype section. The procedure is illustrated in two ways: calculation of forward and backward transmission coefficients of an analog third-order Butterworth filter and a design of a digital seventh-order Butterworth bandpass filter. E.A.K.

N85-33342# Joint Publications Research Service, Arlington, Va.
STATE OF ART AND DEVELOPMENT PROBLEMS IN COMPUTER-AIDED DESIGN OF ELECTRONIC CIRCUITS Abstract Only **c61**
V. N. Ilin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 21-22 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 7-17 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The present third-generation software for computer-aided design of electronic circuits is based on implicit schemes for calculation of transients with stepwise numerical integration of differential equations according to Newton and Gauss algorithms or their modification, on matrix sparsity in simultaneous solution of systems of linear algebraic equations, on use of list forms for matrix representation, and on Monte Carlo or statistical test methods for statistical analysis. Computer-aided design systems must be made more flexible for a broader range of applications which requires an adequate degree of standardization and of reliability assurance. There are several obstacles to a faster adoption and more extensive use of computer-aided design systems, the six major ones are: (1) insufficient algorithmic reliability of programs; (2) inadequate capability of program relative to practical design requirements; (3) inadequate software management and maintenance by enterprises; (4) inadequate documentation and circulation facilities, especially in higher educational institutions where programs are developed; (5) lack of standardized information bases available to all; and (6) nonsystematic approach to adoption and use of computer-aided design systems. E.A.K.

N85-33343# Joint Publications Research Service, Arlington, Va.
MODELING OF ELECTRONIC CIRCUITS WITH HIGH DEGREE OF COMPONENT INTEGRATION Abstract Only **c61**
V. T. Frolkin, Ye. M. Tikhomirova, and V. G. Moshnyaga *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 22-23 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 17-31 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Computer programs for analyzing the static and dynamic performance of large scale integration (LSI) circuits by simulation, calculating their frequency characteristics, and determining the external influence factors within 99% accuracy. They are essentially based on Kirchoff's laws and corresponding systems of equations. With the trend continuing toward VLSI, increase of the computer capacity and speed and development of more efficient new methods and algorithms are necessary. Logic macromodels relate events in time sequence, electrical macromodels relate currents and voltages. Only 0.01 to 10% of all circuit elements participate in any one switching event, time-sequence algorithms of simulation are constructed which incorporated the concepts of activity and latency. A second approach to computer-aided design and performance analysis of LSI and VLSI circuits with best tradeoff between accuracy and speed is mixed simulation particularly applicable to hybrid digital-analog circuits, and a third approach is multi-level simulation with either mixed simulation or a specific form of analysis at each level as in SABLE and VISTA software. E.A.K.

N85-33344# Joint Publications Research Service, Arlington, Va.
BASIC FEATURES OF PERSONAL COMPUTERS Abstract Only **c60**
Jiri Jan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 23 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 32-37 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Personal computers essentially consist of a simple microprocessor, input and output devices, a clock-frequency generator, and a memory. The basic computer capabilities are determined by the clock-frequency generator. Pocket and desk computers are the simplest ones, with a 4-bit microprocessor, but are also correspondingly slow and short. Increasing the word length to 16 bits and the speed correspondingly or increasing the memory capacity involves an increase of the cost. The basic input device is a keyboard, the choice of type usually determined by its cost relative to total computer cost and ranging from inexpensive membrane arrays in general-purpose computers to more intricate and reliable ones in professional models. The basic output device is a display, most often incorporating a cathode-ray tube. Special features are data storage in external memories, on magnetic tape or on paper. E.A.K.

N85-33345# Joint Publications Research Service, Arlington, Va.
ADAPTIVE MODELING OF ELECTRONIC CIRCUITS Abstract Only
I. P. Norenkov and P. A. Somov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 24 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 37-41 Original language document was announced in IAA as A84-42892 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Adaptive simulation is a method for enhancing the efficiency of software facilities for the computer-aided design of LSI and VLSI ciruits. This paper examines the formulation and main principles of the implementation of this method, which consists in the automatic selection of the most appropriate model for each fragment of the large-scale circuit in the course of computations. Methods for solving the three basic problems of adaptive simulation are proposed: the choice of a criterion for changing models; determination of initial (at the moment of change) values of the state variables; and the separation of the circuit into fragments.
B.J.

N85-33346# Joint Publications Research Service, Arlington, Va.
DIAKOPTIC CALCULATION OF CHARACTERISTICS FOR OPTIMIZATION OF LINEAR CIRCUITS WITH RESPECT TO PARAMETERS OF INDIVIDUAL BRANCHES Abstract Only
V. S. Godlevskiy, V. A. Kiselev, and V. G. Levitskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 24-25 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 51-56 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The method of multistep subcircuits is applied to multivariant optimization of linear circuits for sensitivity. The corresponding algorithm of diakoptic design and performance calculation involves extraction of all two-pole branches containing variable parameters into a separate higher-level additional subcircuit. The efficiency of this algorithm is shown to increase with decreasing ratio r/q. The three canonical kinds of extracyted t-th two-pole branch are: (1) one connected to two internal subcircuit nodes; (2) one connected to a boundary node and an internal node; and (3) one connected to two boundary subcircuit nodes. The corresponding subsystem of vector equations for the node voltages is easily constructed by the Gauss method of block-wise elimination and then transformed into a system of partial differential equations, the latter solvable with the use of impedance or admittance matrices. The algorithm was used in parametric optimization of frequency-domain corrective networks for operational amplifiers, specifically a three-stage amplifier with 65 nodes and 182 branches.
E.A.K.

N85-33347# Joint Publications Research Service, Arlington, Va.
ALGORITHMS AND ORGANIZATION OF SOFTWARE FOR COMPUTER-AIDED CIRCUIT DESIGN Abstract Only c61
I. P. Norenkov, V. A. Martynyuk, V. A. Trudonoshin, and V. G. Fedoruk *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 25 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 71-77 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A new software PA6 was developed for computer-aided design of electronic LSI circuits, the two main objectives are to minimize machine time for circuit analysis and to ensure long-range viability. The algorithm involves fragment ation followed by separate iteration within fragments with different degrees of nonlinearity and simultaneous logic-electrical analysis. Incorporation of the latency concept saves machine time, inasmuch as passive circuit fragments are readily identified and their variables temporarily eliminated from the original mathematical model. The internal language consists of two sub-languages, a structural one describing the object with use of FORTRAN for functional relations and a procedural one describing the required computer operations. The principal part of the hardware is a compiler of object modules consisting of an analyzer, a generator, and a constructor. Subroutines include calculation of performance parameters, calculation of nominal requirements and tolerances, multivariant and statistical analysis, and parametric optimization.
E.A.K.

N85-33348# Joint Publications Research Service, Arlington, Va.
ART OF PROGRAMMING PROGRAMMABLE MICROCALCULATORS: CALCULATION OF RESPONSE FROM CURRENT VALUES OF ACTION Abstract Only c61
Ya. K. Trokhimenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 78-84 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Programmable microcalculators can be programmed for the solution of engineering problems such as calculating the response of an object to a given action. In the simplest case this channel is linear so that coefficient alpha remains constant and independent of the input level. It is nonlinear and it becomes necessary to solve nonlinear ordinary differential equations, or extraneous actions interfere so that coefficient becomes a function of time and it becomes necessary to solve the Cauchy problem for nonhomogeneous ordinary differential equations with known initial conditions and with energy storage as well as finite rate of energy transfer taken into account. The microcalculator solves differential equations by the numerical method of finite differences, the algorithm generally involving a Laplace transformation from function of time to a fractional-rational function of complex frequency and approximation of the latter with a power polynomial. The convergence of the computational process is most easily checked against the solution for a standard action such a unit step with known analytical solution to the corresponding differential equation.
E.A.K.

N85-33349# Joint Publications Research Service, Arlington, Va.
COMPUTER SIMULATION OF INTEGRATED INJECTION LOGIC Abstract Only c61
O. M. Mikhaylova and K. O. Petrosyants *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 26-27 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 85-86 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Computer simulation of integrated injection logic on a bipolar VLSI basis is proposed which takes into account the distinct parametric and circuital features of such a logic and the functional integration of its components. The advantages of the proposed method are evident on the classical example of a bistable injection trigger cell produced by epitaxial-planar technology for LSI digital and memory I sup 2L. Performance analysis by simulation is represented in three ways for such a cell: (1) as an array of four separate transistors with eight p-n junctions; (2) as an array of two I sup 2L elements formalized in program modules with six p-n junctions; (3) as a self-contained circuit element formalized in a separate program module with fewer than five p-n junctions, because of the injector region being common to both I sup 2L elements. The machine time saved is 25% with the second variant and 38% with the third variant.
E.A.K.

N85-33350# Joint Publications Research Service, Arlington, Va.
NUMERICAL SIMULATION OF NONISOTHERMAL TRANSIENT PROCESSES IN GaAs DIODE STRUCTURES Abstract Only c61
E. E. Velmre and B. P. Freydin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 27 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 86-88 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A model is constructed for analysis of nonisothermal transient processes following a strong sinusoidal half-wave pulse of millisecond duration in a rectifier on a GaAs semiconductor structure between two conductor plates with an arbitrary number

of different metal interlayers. The model is based on the system of partial differential equations of a semiconductor and the equation of heat conduction, and radiative components of recombination are included, the former according to the Shockley-Reed-Hall mechanism, with the temperature dependence of mobility and all coefficients in the expressions for the two recombination rates taken into account. Mobility and diffusion coefficient are related according to the Einstein equation. The boundary conditions for hole and electron concentrations are determined from the conditions of electric neutrality and thermodynamic equilibrium. The boundary conditions for heat conduction at the edge of the semiconductor structure are established for a strong direct-current pulse. E.A.K.

N85-33351# Joint Publications Research Service, Arlington, Va.
MODELING OF DISCRETE DEVICES WITH USE OF MULTIVALUED LOGIC AND NOMOGRAMS Abstract Only **c61**
A. A. Molchanov, S. M. Makarov, and Kh. Telot *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 28 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 88-89 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Multivalued logic models, most appropriate for accurate analysis of discrete devices with time delays and their dynamics, are also suitable for calculating their static characteristics. A special model was developed for multipass simulation of steady-state processes in such devices using the discrete analog of the Seidel method, with logic 1's and 0's replaced by some ranges of discrete values. Steady-state values of the outputs do not depend on statistical deviations of values of the input vector components from standard 1 or 0 values as long as these deviations do not go beyond those preset ranges. Nomograms for calculating the time delay at each output, as function of the load across the corresponding component, is included in the software. The speed of simulation can be increased by also including lookup tables. E.A.K.

N85-33352# Joint Publications Research Service, Arlington, Va.
SOFTWARE FOR FREQUENCY ANALYSIS OF MICROWAVE CIRCUITS Abstract Only **c61**
L. M. Karpukov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 28 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 94-95 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Software for analysis of integrated microwave circuits on microstrip lines is designed for calculation of the scattering matrix in the frequency domain, calculation of the sensitivity function, byte analysis, and parametric optimization. It is based on description of basic elements in terms of electrodynamic parameters, it is written in high level FORTRAN-4 language without need for low level language, its structure is modular, and it is formulated for maximum versatility. Coefficients of the scattering matrix are calculated in the single mode approximation according to a cyclic algorithm with recurrence relations for series chains of multipole networks. Byte analysis involves resolution of scattering parameters of a circuit with respect to parameters of its basic elements. Parametric optimization proceeds with respect to an additive target function which is a weighted sum of partial target functions. The relatively small number of different basic elements facilitates efficient running of the programs without sacrifice in versatility. Execution of the programs on a YeS-1022 conputer comfirm that these programs are simple, reliable, and use machine time economically. E.A.K.

N85-33353# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR COMPUTER-AIDED DESIGN OF ANALOG ELECTRONIC CIRCUITS Abstract Only **c61**
Ya. K. Trokhimenko, V. K. Lovkiy, N. I. Yastrebov, and N. V. Grebenkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 29 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 95-96 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The PAKTOR-1A is a system for computer aided design of analog electronic circuits and for calculation of their static and dynamic performance, including stability analysis, and calculation of their operating, frequency, and time characteristics during the initial design stage. The software has a modular structure. Included is a correctible library containing models of linear and nonlinear active circuit components. The input language is formulated for running the program in the dialog mode, with symbols as C12=10pF and T2=KT315 for passive and active element respectively, the algorithmic language is PL-1. The software yields steady state voltages, currents, and power, frequency characteristics with uniform or variable frequency steps, transient and pulse response characteristics calculated by inverse Laplace transformation, and a stability analysis, either on the basis of the Hurwitz criterion with expansion into a continued fraction or on the basis of frequency holograms. E.A.K.

N85-33354# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF RADIOELECTRONIC CIRCUITS WITH SOFTWARE FOR MODELING OF INTEGRATED CIRCUITS ON UNIFIED SYSTEM COMPUTER Abstract Only **c61**
L. Z. Katsnelson, Ye. S. Kelman, and L. S. Pokhvalina *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 29-30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 97-98 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Software for modeling integrated circuits on a YeS computer and subsequent design optimization of radioelectronic devices according to the criterion of minimum capacity margin is available which covers steady state performance and frequency characteristics separately or together. Modified Ebers-Moll equations with the Early effect serve as the model of a transistor. The optimization problem is solved by the method of discrete maximum with steepest descent. The software, consisting of over 300 programs written in FORTRAN, can handle up to 80 transistors, 170 nodes, and 540 two pole networks. Author

N85-33355# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM WITH MINICOMPUTER FOR PLOTTING PERFORMANCE CHARTS Abstract Only **c61**
S. P. Nosikov and V. T. Frolkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 99-100 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Plotting performance charts is part of the documentation needed for validating the design of radioelectronic devices. There is also a need for plotting such charts automatically so as to ensure the necessary accuracy and reliability as fast and as frequently as possible. A dialog system for chart plotting has been developed to serve this purpose, which uses a standard SM-4 on line minicomputer with a direct access memory of 32,000 words capacity and with minimum peripheral equipment, the latter including only a video terminal, and alpha numeric printer, and a magnetic disk storage. The software is flexible and adjustable with a modular structure, consisting of universal programs applicable to all kinds of charts and a special data base where distinctive features of each performance chart are filed. The four separate programs written in FORTRAN are KRR1 for composing lists of circuit elements, KRR2 for requesting and receiving user's specifications, KRR3 for revision, only if necessary, and KRR5 for breaking up the array of data lines into parts to which lines from the data base are added to produce together ready 290x330 sq mm chart sheets. Author

N85-33356# Joint Publications Research Service, Arlington, Va.
ALGORITHMS FOR CONSTRUCTING MODELS OF CIRCUIT ELEMENTS IN INPUT LANGUAGE OF COMPUTER-AIDED DESIGN SOFTWARE Abstract Only **c61**
V. L. Kogan, V. L. Uskov, and A. S. Belotserkovskiy *In its* USSR

Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 30-31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 100-102 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A method of modeling, a new device or circuit element with computer aided design software is proposed, namely writing the analytical expressions which describe it in the input language. Two types of analytical models are considered, universal ones and modifiable ones. In each case the corresponding mathematical equations are put in a form suitable for integration by implicit schemes. The procedure is demonstrated on a scalar equation for current i as a function of voltage v, time t, and rate of change of voltage i=f (v,v,t). The algorithm of solving such an equation involves replacing the time derivative of voltage with its difference analog and solving the resulting equation numerically, by the Newton iteration method. The procedure is somewhat different for universal and modifiable models, considering that the former is completely describable in the input language while in a latter only some parameters are given as functions of time or space coordinates. Author

N85-33357# Joint Publications Research Service, Arlington, Va.
ALGORITHM FOR DETERMINATION OF ISOMORPHIC GRAPHS Abstract Only **c61**
Ye. N. Ruzayev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 102-103 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

An algorithm is proposed for determination of isomorphic graphs in the analysis and synthesis of standard arrays of modules or subsystems. It is particularly affective in the case of nonoriented graphs with sparse contiguity matrices. There are 13 steps and 5 loops between start and stop, including one tabulation, for finding vertices and paths. The number of computing operations lies between 0(n) and 0(n!), pathfinding being simplified by use of modulo-2 scalar vector products of symbols over the field. Author

N85-33358# Joint Publications Research Service, Arlington, Va.
METHOD OF ESTIMATING CONVERGENCE OF HAAR COEFFICIENTS IN MESSAGE COMPRESSION PROBLEMS Abstract Only **c64**
Yu. V. Sobolev, P. F. Polyakov, and V. G. Ivanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 31-32 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The conventional method of estimating the convergence of a truncated Haar series, namely calculation of its coefficients and subsequent restoration of the original message on their basis by equating some of them to zero while adding the squares of differences between original and restored values, involves an unwieldy orthogonal transformation and estimation of its error. The process can be simplified by discarding the tentative last coefficient in the series and replacing the next pair of originally read values with their average. The error is then calculated as the sum of the squares of differences between these two values and their average, whereupon the next tentative last coefficient is discarded and the procedure is repeated. The respective two errors are compared and the procedure is continued till the error becomes acceptable. Estimates of the numbers of operations, additions or subtractions and multiplications (division by an integer being negligible) as well as of the corresponding computer time and the transformation error indicate that, in a typical case of a compression coefficient of 2 and a Haar series with 16 coefficients, this method can be up to 10 times more efficient than direct calculation and almost twice as efficient as with error estimation by known fast algorithms. Author

N85-33359# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SENSITIVITY FUNCTIONS FOR DISCRETE DYNAMIC SYSTEMS FROM RESULTS OF FUNCTION MODELING ON DIGITAL COMPUTER Abstract Only **c64**
Ye. I. Glushankov, V. V. Davydenko, and V. M. Terentyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 32 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 105-106 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The sensitivity function (the partial derivative of 2 w.r.t. p) characterizing the performance of a discrete dynamic system, namely the response of its performance indicator z to change in the variable model parameter p, is calculated by differentiating z(p) with respect to p. This requires expressing the function z(p) in an analytical form, which can be done according to the Lagrange interpolation rule with use of a power polynomial at the nodes. The algorithm, consisting of seven steps and one loop between start and stop, solves the sensitivity problem as an optimization problem with the appropriate functional as optimality criterion. It is demonstrated on a multidimensional linear filter which extracts the useful signal from a mixture of background interference and perturbation noise, the latter describable as a white random sequence. As optimality criterion for z in this case serves the ratio Sp [V sub x' (00)]/Sp [V sub x' (0)] or preferably the ratio Sp [V sub x'(0)]/Sp[V sub x' (00)] with simpler interpolation and calculation of derivatives V sub x' (0) initial dispersion of estimation error, V sub x' (00) final steady state dispersion of estimation error). Such a problem can be solved by this method in real time and without complication of the program. Author

N85-33360# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF CROSSTALK IN NONHOMOGENEOUS MULTICONDUCTOR LINES Abstract Only
V. G. Oreshnikov and A. S. Shaposhnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 33 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 5, May 1984 p 40-42 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Multiconductor crosstalk is caused by interconductor electromagnetic and static induction and resistance and is determined by primary line parameters. The currently used model and phase methods for line modes are applied for particular modes but cannot analyze random load line operations because receiver resistance must be matched with the continuous telegrapher equation lines while known iterative methods converge slowly to the boundary conditions and require considerable computer time expenditure. Analysis is more difficult for nonhomogeneous multiconductor modes because the differential or difference equations have variable complex coefficients. A method is given based upon a transition from line equations with particular differentials to approximating difference equations, i.e., to discrete line models. The method makes it possible to determine effectively modes for different boundary conditions and reduces nonhomogeneous multiconductor modes to elementary operations on low order matrices. Computer procedure is simplified by special features of the general matrix so that programming is improved and machine time reduced. Examples are given. Author

N85-33361# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF OPTIMUM RECEIVER AND PROCESSOR FOR INTERFERING RADIO PULSE SIGNALS Abstract Only
A. L. Ryabtsov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 33-34 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 28-30 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Synthesis of the optimum receiver processor for interfering radio pulse signals is considered, assuming an additive mixture of useful signal and interference signal at the input. The useful signal is one resulting from interference of an incoming pulse and the reflected pulse which lags behind the former by a random time interval. The problem is formulated as one of estimating the state vector, which satisfies the corresponding a priori stochastic differential matrix equation, and solving the appropriate general equations of optimal nonlinear filtration in accordance with the

theory of conditional Markov processes. A quasicoherent receiver constructed on this basis contains a shaper of unit amplitude video pulses, two tunable oscillators and two delay time estimator channels, and an array of amplifiers controlled by a gain computer which takes into account the phase relation between interfering signals. Author

N85-33362# Joint Publications Research Service, Arlington, Va.
SYSTEM OF MICROPROCESSOR INSTRUCTIONS Abstract Only **c60**
V. Ye. Lokhmatyy and S. N. Trankov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 40 Transl. into ENGLISH from Avtomatika, Telemekhan. i Svyaz (Moscow), no. 5, May 1984 p 18-21 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The system of instructions for the KR5801K80A microprocessor includes instructions to perform arithmetic operations, instructions to perform logic operations, instructions to perform control transfer unconditionally or conditionally, instructions to control the stack, the input, the output, or the state of the microprocessor, and instructions to allow or forbid interrupt. Arithmetic operations are addition and addition with carry, subtraction and subtraction with borrow, incrementing a register, a register pair, or a memory cell, addition of contents in HL register pair to contents in any pair of registers, and decimal correction of an adder. Logic operations are conjunction of accumulator contents with register contents ANA R, conjunction of accumulator contents with a constant ANI DATA, exclusive OR (A) with (R), comparison of accumulator contents (A) with register contents (R), cyclic shaft to left RLC of accumulator contents (A), and cyclic shift to left through carry tag RAL of accumulator contents (A). For illustration, two simple programming tasks are performed with such instructions. Author

N85-33363# Joint Publications Research Service, Arlington, Va.
BUILDUP OF ELECTRIC CHARGE IN FOIL DIELECTRICS DURING GAMMA IRRADIATION Abstract Only
S. N. Makeyev, N. I. Filatov, and A. T. Shmigol *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 42 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 51-54 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Theoretical and experimental studies of electric volume charge building up in polymer foils under ionizing radiation reveal two mechanisms at work here. One is the difference between the absorption capacities of the foil material and of the other material in contact with it, the second mechanism is knockout and slowdown of Compton electrons. Seven industrial grades of polymer materials in foils of 0.2-2.0 mm thickness were exposed to gamma radiation in doses of 1.3-6 from a 60Co source at 100 C: SF-2-50 and SF-2N-50 (glass Textolite), FDM-2 (glass Textolite), GF-2-50, PEVD (high density polyethylene), PKT-5, FLAN-10. Data were obtained on the buildup of volume charge density as function of the irradiation dose and as function of the intensity of the external electric field (one electrode grounded, and electrode connected to electrometer amplifier) at two fixed irradiation doses, also on the volume charge relaxation as function of time. The data were evaluated in terms of thermal stimulation current, the charge calculated by graphical integration of thermostimulated current curve. The results indicate that both processes do depend in a complex manner on the kind and the thickness of the dielectric foil material as well as on the conditions of irradiation and storage respectively. Author

N85-33364# Joint Publications Research Service, Arlington, Va.
PARTIAL DISCHARGES IN AND ELECTRIC STRENGTH OF HIGH-VOLTAGE POLYMER INSULATION AT CRYOGENIC TEMPERATURES Abstract Only
V. P. Vdoviko, E. D. Shumilova, V. V. Mikhaylov, S. P. Andryukhin, V. M. Shatokhin, and Ye. I. Aksenova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 43 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 58-62 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A study of partial discharges in multilayer polymer insulation in liquid nitrogen was made, for the purpose of determining the effect of overvoltages on initiation of such discharges and the laws of material breakdown at cryogenic temperatures. Specimens of six high voltage insulation materials (polytetrafluoroethylene, polyethylene tetraphthalate, high density polyethylene, polyimide, polypropylene and polypropylene paper) in stacks of 2-12 layers of corresponding 45-520 um total thickness were first tested under alternating voltages with the frequency varied from 50 to 1000 Hz. They were also tested under a 300 Hz oscillatory voltage pulse simulating a switch on surge, with a logarithmic decrement of 3, superposed on a 50 Hz alternating voltage in phase with the positive amplitude of the latter. The data, evaluated in terms of insulation life as function of the electric field intensity and as function of the frequency, serve as basis for accelerated testing within given voltage and frequency constraints which take into account the aging factor. A statistical analysis based on the Weibull distribution and linear refression yields the values of constant coefficients and exponents in those relations. Author

N85-33365# Joint Publications Research Service, Arlington, Va.
METHODS OF RELIABILITY DESIGN OF SEMICONDUCTOR POWER DEVICES Abstract Only
A. M. Grigoryev and V. L. Shper *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 45 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 42-49 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Reliability design of semiconductor power devices requires a classification of operating modes, calculation of the reliability indicators for each class, and convertibility from set of operating modes to another, either in the same class or in another one. There are noncyclic and cyclic modes of operation, the probability of failure free operation or the failure rate in noncyclic modes depending foremost on the mean temperature of the device and the applied voltage. Cyclic operation is characterized by temperature cycles, pulse cycles, current overloads, or combinations thereof. Appropriate relations for the reliability indicators as functions of the corresponding variables are established for each type of operating mode. Author

N85-33366# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EDGE EFFECTS ON PERFORMANCE OF ELECTROOPTICAL LENS Abstract Only
N. A. Gusak and A. G. Mashchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 46 Transl. into ENGLISH from Radiotekhn. Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1405-1407 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The influence of edge effects on electrooptical lens performance is quantitatively assessed by solving the problem of the potential distribution in a crystal with semiinfinite electrodes. Significant distortions are detected along the x axis, which are plotted as a function of the instance from the center of the lens, demonstrating good agreement between the theoretical and experimental data. The nature and amount of distortions are found as a function of the degree of limiting of the electrodes. Author

N85-33367# Joint Publications Research Service, Arlington, Va.
DESIGN OF ELECTROOPTICAL SYSTEM WITH ANNULAR CATHODE AND ELECTROSTATIC COMPRESSOR Abstract Only
Ye. K. Yeroshchenkov, A. B. Yesichev, M. A. Zaŷyalov, A. I. Kazakov, and Yu. V. Kudryashov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 46-47 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1429-1430 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

An electrooptical system employing an annual converging beam and an electrostatic compressor is examined in which the beam

is compressed in the compressor field and gradually takes on a solid cylindrical form. The compressor is a system of two electrodes consisting of coaxial conical surfaces. The electrons are deflected and put into trajectories parallel to the axis by the transverse electrical field of a compressor, which is also the anode of the electrooptical system. Optimization by numerical analysis is performed by computer with allowance made for a relativistic increase in the mass and intrinsic magnetic fields of the beam. The optimum radius of curvature of the emitter surface is found to be significantly larger than that indicated in the preliminary calculations, and can be increased to infinity with no significant loss of laminarity of the trajectories. Author

N85-33368# Joint Publications Research Service, Arlington, Va.
DESIGN OF INDUCTIVE SHIFT TRANSDUCERS Abstract Only
V. K. Guselnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 52 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 5, May 1984 p 70-71 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Plunger type inductive transducers detecting shifts are simple in design, show good metrological indicators, and consist essentially of an induction coil and a ferromagnetic core. The design problem is to increase sensitivity and to reduce error. However, the determination of operating characteristics on the basis of electromagnetic circuit theory is difficult and leads to many errors. Consequently, an experimental set up was made which consisted of a measurement generator constraining the transducer coil, a micrometer screw and a frequency meter. It was used to establish relations for operational parameters which make it possible to design a transducer of the required size with the necessary sensitivities and error limits and to specify the required design parameters. Author

N85-33369# Joint Publications Research Service, Arlington, Va.
QUANTIZER OF IMAGES OF HEAT FIELDS OBTAINED BY RUBIN-TYPE INFRA-RED IMAGERS Abstract Only c35
O. K. Shabashev, A. A. Muraveyskaya, and S. V. Berezin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 53-53 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 4, Apr. 1984 p 23-25 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A device for quantizing images of heat fields for RUBIN infrared images is described which produces an image with discretely varying density, in addition to the half tone black and white heat field image. Quantized images are contained with the help of RUBIN infrared images by exploiting the fact that the characteristics code of the EKhB-4 electrochemical paper employed allows 10 visually discriminable densities to be recorded using the corresponding gamma correction. The quantizer provides three operating modes which differ in quantization step and number of isotherms recorded on the thermogram. The quantizer permits fast, accurate visual analysis of heat field images. Author

N85-33370# Joint Publications Research Service, Arlington, Va.
MAGNETIC SHIELDING WITH SUPERCONDUCTORS BASED ON NIOBIUM-TIN COMPOUNDS Abstract Only c76
R. V. Kalashnikov, N. B. Trusov, and A. N. Zvenigorodskaya *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 54 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 49-51 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Use of superconductors for shielding magnetic fields offers several advantages, they can be made smaller in size and mass than shields made of ferromagnetic metals (iron, steel) because of their higher saturation induction in constant magnetic fields and thinner than shields made of nonmagnetic high conductivity metals (copper, aluminum) because of the stronger skin effect in low frequency alternating magnetic fields. The behavior of a type 2 super conductor materials such as Nb3Sn in an external magnetic field is analyzed on the basis of the Kim-Hempstead-Strand model and the appropriate Maxwell equation for penetration depth in a plate. An experimental study was made with a search coil inside a UIS superconducting solenoid. Two kinds of cylindrical shields with an inside diameter of 28 mm were used: (1) monolithic ones made of Nb and Sn powders sintered at 1050 C and formed into shells of 2-8 mm wall thickness; (2) laminate ones made of 0.1 mm thick Nb3Sn tape wound into shells of 1-40 layers and correspondingly with 1-4 mm wall thickness. According to the data, laminate shields are more effective than monolithic ones. Author

N85-33371# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SOLUTION OF BLOCH'S EQUATIONS IN TIME DOMAIN Abstract Only c66
Yu. K. Levin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 55 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1417-1420 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The significance of the third term of the spectral solution of the Bloch equation for three pulse operation of a spin device is analyzed by examining the time domain solution of the Bloch equation characterizing the behavior of the magnetization vector of a spin packet precessing about a constant internal magnetic field directed along the z axis with a radio frequency magnetic field applied along the x axis. It is shown sufficient to use the first two terms of a spectral solution of the Bloch equations to describe the spin device; the justification for discarding the third term of the solution is validated. Author

N85-33372# Joint Publications Research Service, Arlington, Va.
RECORDING SMALL FREQUENCY DRIFTS OF MICROWAVE OSCILLATORS Abstract Only
V. P. Denisov, S. A. Lebedinskiy, and V. I. Nazarov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 56 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 90-92 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A method of recording small frequency drifts of ultrahigh-stability microwave oscillators by heterodyning without causing instability is proposed, a method which involves two frequency stepdowns with subsequent measurement of period fluctuation in the low-frequency signal by means of an electronic period counter. The latter contains an internal quartz oscillator and its relative error of period measurement, which determines the sensitivity of the method, depends on the period of its fluctuations and on the signal-to-noise ratio at its output as well as on the relative frequency instability of that quartz oscillator. When the signal-to-noise ratio is high, above 60 dB, then the fluctuation period of that quartz oscillator becomes the dominant factor and the sensitivity of the method is proportional to the low frequency squared. The instrumentation includes a balanced microwave mixer in the form of a hybrid ring of microstrip lines with a ferrite diode at each of the two inputs an amplifier on the output side in the first stage, a low-frequency mixer feeding through a tuned amplifier into the electronic period counter with a frequency synthesizer acting as heterodyne in the second stage, and a monitoring spectrum analyzer across the counter input. Author

N85-33373# Joint Publications Research Service, Arlington, Va.
CALCULATION OF EXTERNAL MAGNETIC FIELD OF A SHIELDED TRANSFORMER Abstract Only
S. B. Vasyutinskiy, B. V. Rusanov, and I. P. Stepanova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 59 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 5, May 1984 p 35-39 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

It is difficult even by computerized numerical methods to compute external magnetic fields from shielded transformers by direct determination of boundary conditions for three-dimensional piecewise nonhomogeneous regions. Because the effects are important at a considerable distance, an approximation method is

proposed with acceptable results for points at distances 1.5-2 times the longest transformer dimension. The real shields are conceived as spherical and the transformer as a set of paired magnetic charges. The superposition method is used and field spherical harmonics are determined for the paired charges inside the shielding. Shield coefficients are established for different harmonic and external field harmonics are computed with the shielding. The effective shield coefficient is established for points of interest. The number of field harmonics depends upon the desired precision and increases as computation points approach the charges. Shield coefficients depend upon harmonic orders and the characteristics of the shields and not on the arrangement of the field sources and computation point coordinates. In general, the shield coefficient of two spherical shields is not the product of the screen coefficients, but is equal to this product if the screens are sufficiently far apart. An experiment showed an error of 11% for computed values for a transformer and much greater errors for a coil and bar apparatus. Author

N85-33374# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF DESIGN PARAMETERS FOR ALTERNATING CURRENT STABILIZER BASED ON MAGNETIC SUSPENSION Abstract Only
B. K. Bul, Ya. R. Abdullayev, and A. V. Alekseyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 61 Transl. into ENGLISH from Elektrichestvo (Moscow), no. 5, May 1984 p 67-69 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

In the design of magnetic suspension ac stabilizers a set of factors destabilizing left-hand winding dynamics is computed and values established for winding heat-up, duty cycle factor and winding materials densities and resistivities. The objective is to design the magnetic suspension so that disturbances will not put the stabilizer out of order and utilizing the minimum amount of materials. A method was developed showing that the mass of materials and parameter optimization depend upon two dimensionless variables. A nonlinear program created in order to find the variable function minimum and computations on the Elektronika D3-28 computer showed an error not greater than for previous methods. Precision depends upon a uniform magnetic field in the suspension gap and almost not at all on stabilizer geometry. The new method made it possible to construct stabilizers containing 30-40% less mass than previous designs and can be used for other suspension-type equipment. Author

N85-33375# Joint Publications Research Service, Arlington, Va.
STANDARD SERIES OF DIRECT-CURRENT MOTORS FOR REGULATED ELECTRIC DRIVES Abstract Only
I. Cholewicki, M. Lubina, V. A. Kozhevnikov, A. V. Kochnev, K. Skoda, and E. Voleskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 61-62 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 2-4 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A standard series of d.c. motors for electric drives with speed and torque regulation has been developed. Thyristor-type converters for machine tools with digital program control are also being developed. Meeting future goals requires modification of the motor frame from the conventional round to a nearly square one, a larger ratio of armature stack length to diameter, better cooling, and insulation of a higher temperature class. In addition, it is necessary to laminate the housing partially or completely and to include a compensating winding. The basic motor configuration is 1 M 1001, according to Council of Mutual Economic Assistance (CEMA) Standard 246-78, with at least IP 23S protection and 1C 06 or 1C 05 cooling (shaft height from 112 mm up) and 1C 01 cooling (Shaft height or up to 250 mm). The series will be designed for a reference speed of 1500 rpm with not more than 15% armature current fluctuation, with speeds of 300-3000 rpm depending on voltage and motor size and torque regulation 1:200 (externally cooled motors) or 1;5, 1:10, 1:30 (self-cooled motors). Prototype motors with 132 mm and 355 mm shaft heights have already passed all tests. Author

N85-33376# Joint Publications Research Service, Arlington, Va.
EFFECT OF POLYMER ADDITIVES ON CHARACTERISTICS OF DIRECT-CURRENT MOTOR WITH LIQUID DIELECTRIC FILLER Abstract Only
V. I. Ivanov, S. T. Bashkatova, A. A. Lubsanova, S. B. Tokarev, G. N. Zadaroshnaya, and I. N. Pastukhova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 62-63 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 4-7 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

In d.c. motors filled with dielectric of the hydrocarbon kind hydrodynamic losses can constitute up to 40% of the total losses. Consequently, a study was made to determine the proper additive and amount to reduce the hydraulic drag without dehomogenizing the liquid filler over long operating periods. Two polymethacrylates, never before used for this application were selected. Two motors of different size, a 0.8 kW DPK and a 6 kW DPK, were tested in kerosene with 0.005-1.0 wt% of these additives. An evaluation of the data, including the hydraulic drag coefficient as a function of the Reynolds number and the temperature rise at critical motor components (armature winding in slots, armature endturns on drive side, armature teeth, liquid in interpolar space, field winding, pole pieces) with or without additive, has yielded the optimum range of additive concentration for each motor size. An evaluation of the heat transfer at critical surfaces, with the aid of dimensional analysis, has yielded the semiempirical relation $Nu=CRe^{0.65}Pr^{0.4}Km$ (C- constant factor different for each surface, Km- constant factor with exponent different for each additive polymer materials). The results can be extended to transformer oil and diesel oil as liquid motor-filling medium. Author

N85-33377# Joint Publications Research Service, Arlington, Va.
INDUCTION MOTORS WITH MINIMUM WASTE OF MAGNETIC IRON Abstract Only
Ye. P. Boyko, F. K. Makarov, Yu. A. Kremeshnyy, and E. A. Stepanyants *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 63 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 12-14 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

An induction motor with minimum waste of magnetic iron has been developed. The stator core is made of silicon-iron steel strip, its width equal to the core height, and wound on edge to form a stack. Stator slots closed on the bore side and open on the outside for winding are formed together with teeth separating them by corrugating a silicon-iron steel strip of width equal to the stack length and sliding it, after winding, inside the core with an insulation interlayer between them. The thickness of this interlayer does not exceed 20% of the air gap between stator and rotor, but even this degrades motor starting and running performance. The performance is also degraded by leakage of magnetic flux through the slot bridge on the bore side and by nonuniformity of the air gap width resulting from corrugation of the stator bore surface. These drawbacks are partly compensated by lining the slots with film insulation instead of sleeves or tubes, thus making more slot space available for copper. Prototypes were built with 0.5 mm thick strip of 2212 steel for the teeth and strip of 08KP steel for the core, separated by a 0.03 mm layer of EKD-14 epoxy compound, with the air gap correspondingly narrowed from 0.25 to 0.2 mm. The stator winding is a singlelayer one of enamelled and triple vinyl-covered 0.67/0.73 mm copper wire, the slots insulated with Dacron film. Author

N85-33378# Joint Publications Research Service, Arlington, Va.
MAGNETIC FIELD AND EQUIVALENT CIRCUIT OF INDUCTION MOTORS WITH SHIELDED POLES Abstract Only
V. I. Katkyavichyus, I. V. Bukshnaytis, and D. K. Banite *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 64 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 14-16 (For primary document see

N85-33314 22-33)
Avail: NTIS HC A05/MF A01

The magnetic field distribution in the air gap of induction motors with shielded poles is calculated, taking into account forward and backward harmonics as well as their skew. An analysis is made on the basis of theoretically or experimentally determined magnetic induction (flux density) rather than by the method of symmetrical components. Measurements were made with a search coil along the stator bore and an R-56 a.c. compensator. The magnetic field is calculated as the sum of fields alternating under the shielded part and the unshielded part of the pole arc, from values at points separated in time by quarter periods of the fundamental component. An equivalent circuit diagram is then constructed, assuming a sinusoidal input voltage at the stator.
Author

N85-33379# Joint Publications Research Service, Arlington, Va.
SLIDING DISCHARGE IN CO2 AND EXCIMER LASERS Abstract Only c36
D. Yu. Zaroslov, G. P. Kuzmin, and V. F. Tarasenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 65 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1217-1241 Original language document was announced in IAA as A84-43176 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

Published data on the use of sliding discharges in CO2 and excimer lasers are reviewed. It is shown that sliding dischargers can serve as the basis of extended open-type UV sources which (in terms of their energetic, spectral, and temporal characteristics) may be applied as preionizers and plasma electrodes in pulsed and repetitively pulsed lasers. Plasma electrodes in pulsed molecular lasers can compete with beams of accelerated electrons for the preionization of the active medium. B.J. (IAA)

N85-33380# Joint Publications Research Service, Arlington, Va.
CONFERENCES OF QUANTUM-RADIOOPTICS SECTION Abstract Only c60
A. N. Mikaelyan and M. M. Koblova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 66 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 93 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

A joint conference was held on 28 to 29 June 1983 at the Kaunas Polytechnic Institute in Kaunas by the Quantum-Radiooptics Section of the Scientific and Technical Radio Engineering, Electronics and Communications Society imeni A. S. Popov and the Continuous Seminar on Theory of Mechanisms and Machines at the USSR Academy of Sciences. The subject of the conference was problems of producing optoelectronic devices, utilizing latest developments in optical disk memories, optical systems for permanent information storage, and laser systems for information retrieval. The three most interesting reports were those on hologram readout with gap stabilization within + or - micrometer, on X-Y plotters with vibrometers running at frequencies up to 100 kHz with smooth or stepwise current regulation to move a mass of up to 10 kg, on position, velocity, acceleration transducers providing feedback for precision placement of heavy equipment weighing 100-2000 kg on a platform. Author

N85-33381# Joint Publications Research Service, Arlington, Va.
USSR REPORT: ELECTRONICS AND ELECTRICAL ENGINEERING
21 Mar. 1984 83 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UEE-84-003) Avail: NTIS HC A05

Progress in U.S.S.R. electronics and electrical engineering is highlighted. Subject matter covered includes: (1) aerospace and electronic systems; (2) antennas and propagation; (3) broadcasting/consumer electronics; (4) circuits and systems; (5) communications; (6) computers; (7) electrical insulation; (8) electron devices; (9) instrumentation and measurements; (10) microwave theory and techniques; (11) quantum/electronics/electro-optics; (12) solid state circuits; and (13) sonics and ultrasonics. For individual titles, see N85-33382 through N85-33432.

N85-33382# Joint Publications Research Service, Arlington, Va.
ON THE PRINCIPLE OF UNIFORMITY OF SATELLITE COMMUNICATIONS SYSTEMS Abstract Only c17
L. Ya. Kantor *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 1 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 10, Oct. 1983 p 23-26 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

It is not clear whether the criterion of homogeneity for a satellite-to-Earth link is to be considered as the equal power of the onboard transmitters of the potentially incompatible systems or equal power density at the boundary of the service area. A detailed analysis is presented of a system consisting of two satellites in geostationary orbit which service different areas, where the differences between them are such that the system 2 satellite has a more harmful impact on the system 1 Earth station than does the system 1 satellite on the system 2 Earth station. Crosstalk between the systems on the uplink is not considered here for the sake of simplicity, although the analysis can be readily extended to this case. The requisite condition for two such satellite systems being uniform is that the angular separation between the satellites of systems 1 and 2 from the standpoint of the effect of the interference of system 2 on system 1 is equal to the requisite separation from the standpoint of the effect of system 1 interference on system 2. This criterion is used as the basis for the derivation of quantitative expressions for the choice of the parameters of uniform systems. B.W.

N85-33383# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL PROTOTYPE NETWORK IN DUBNA EXPERIMENTAL SATELLITE COMMUNICATIONS SYSTEM Abstract Only c17
V. L. Bykov, Ye. Aleksandrova, B. Balabanov, V. Bauer, Sh. Berto, K.-D. Vantke, I. Vit, A. Kavetski, V. Liebsch, V. V. Svyatogor et al *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 2 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 10, Oct. 1983 p 27-32 Previously announced as X84-72881 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The communications center of a prototype international satellite system using the 11 and 14 GHz has been in service for more than a year at Dubna in the USSR. The Dubna prototype system is intended for: (1) Comprehensive study of propagation conditions at frequencies above 10 GHz on ground and satellite links and the gain of several years of statistical data on depolarization and absorption in the atmosphere at these frequencies, as well as the distribution of precipitation rates and sky noise temperature and the determination of the correlations between these factors; (2) Estimating the impact of the atmosphere and weather conditions on data transmission via satellite links; and (3) Testing new hardware for Earth and satellite stations for broadcasting and communications. To enhance the data storage reliability of the Dubna computer center, it is backed up by a similar center at Neu-Holm in the GDR. The precipitation rate gauges are described and the equipment complement of the computer center for statistical data processing, designed around the Robotron 4201 computer, is detailed. B.W.

N85-33384# Joint Publications Research Service, Arlington, Va.
BASIC PROPERTIES AND INTERPRETATION OF SYNTHESIZED RADAR IMAGES OF SEA WAVES WITH LONG SYNTHETIZATION TIME Abstract Only c48
A. V. Ivanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 3 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radiofiz. (Gorkiy), v. 26, no. 5, May 1983 p 540-550 Previously announced in IAA as A83-41793 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The synthetic-aperture-radar (SAR) imaging of sea waves is considered as a process of measuring the correlation between

values of backscattered radiation of the SAR for different azimuthal positions of the SAR platform. A relatively simple description is proposed for the focusing effect peculiar to the SAR imaging of sea waves, and it is shown that the wave image contrast does not degrade with increasing synthesis time. The same results are obtained by the direct analysis of the transformation of the radar input signal (calculated in accordance with the two-scale model of scattering) into an image for the case of a sinusoidal wave without limits on the synthesis time. B.J.

N85-33385# Joint Publications Research Service, Arlington, Va.
MULTITRUNK HIGH-FREQUENCY MULTIPLEXING OF ANTENNA-WAVEGUIDE CHANNELS Abstract Only **c32**
A. M. Model, V. A. Stuzhin, and Yu. S. Shkarinov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 4 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 30-33 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The number of powerful transmitters feeding into a common antenna-waveguide channel can be increased by nonresonance high-frequency multiplexing of that channel. Sequential pairwise combining of signals from the transmitters can be achieved either according to an amplitude-difference scheme or a phase-difference scheme. In the first case the ratio of amplitudes varies periodically with the frequency and tends to 1 as its geometric mean, while the phase difference remains exactly +90 deg or -90 deg. In the second case the difference of phases varies periodically and tends to 0 or 180 deg., while the ratio of amplitudes remains exactly 1. Nonresonance multiplexing systems feature a higher electric strength, a better structural decoupling of inputs, smaller phase distortions and lower insertion losses than resonance-type multiplexing systems with band separation or elimination filters. Here for illustration are described the design and performance characteristics of such a multiplexing system which combines signals from six 3 kW - 6 GHz transmitters, each operating within a 34 MHz band with a 50 MHz separation between center frequencies of adjacent bands. B.W.

N85-33386# Joint Publications Research Service, Arlington, Va.
METHOD OF CONSTRUCTING FOLDING UMBRELLA-TYPE ANTENNA Abstract Only **c32**
V. I. Loman and M. V. Gryanik *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 5 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 77-79 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Studies of the focusing properties of umbrella-type reflectors show that a redistribution of the field takes place towards the edges of the focal spot. This explains the poor efficiency when feed radiators with a point phase center are used in such antennas. If the reflector is configured with a shifted parabolic generatrix for the surface, and a feed irradiation system having partial phase enter in the form of a ring is used, the phase errors can be compensated for to a considerable extent. Dual-reflector antennas with an elliptical, hyperbolic or parabolic generatrix of the subdish and a shifted parabolic axis for the large reflector have an annular phase center; thus, the construction of a folding umbrella-type antenna using one of these configurations will make it possible not only to realize the advantages of these antennas, i.e., significantly less shading of the aperture by the feed radiating system, reduction of the effect of the reflector on the feed radiator and the capability of fastening the reflector directly to the feed radiator, but also substantially to enhance its efficiency through more precise matching of the shapes of the partial phase center of the feed system and the focal region of the umbrella-type reflector. B.W.

N85-33387# Joint Publications Research Service, Arlington, Va.
FREQUENCY INDEPENDENT PARABOLIC PHASED ANTENNA ARRAY OF LOG PERIODIC ANTENNAS Abstract Only **c32**
B. A. Veriga and N. I. Vyakhirev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 6 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 72-74 Previously announced in IAA as A83-45686 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A frequency-independent phased array antenna made of log-periodic radiators is presented which, in contrast to the Duhamel array, does not employ phase shifters at the antenna inputs to produce radiation in the main direction. The array considered here is a system of radial log-periodic radiators that form a parabolic phased-array antenna. The dipoles of all the radiators having the same size are located along a parabolic line. The operation of the parabolic array at various frequencies is equivalent to that of a series of confocal parabolic mirror antennas excited from a single source. V.L.

N85-33388# Joint Publications Research Service, Arlington, Va.
MINIMIZING FIELD SCATTERED BY SLENDER DIPOLES Abstract Only **c32**
L. I. Ponomarev and A. V. Dolgiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 7 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 48-53 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The problem of minimizing the field scattered by a single dipole or dipole array is characteristic of dual-frequency antenna arrays colocated in a single aperture, where one of the arrays is a dipole array and is positioned above the other. It is also characteristic of efforts to reduce the effective scattering surface area of dipole antennas. The problem of reducing dipole antenna scattering is solved by means of active suppression. This is accomplished by feeding to those dipoles on which the external electromagnetic impinges, an energy at the same frequency as the incident field via additional feed circuits. A reduction in the overall current induced in the dipoles can be achieved in the additional feed circuits by the appropriate choice of the amplitude and phase of the excitation. The formulation of the problem of such excitation is simplified by using simulation in the form of several e.m.f. sources connected to the dipole sections through matched circulators and feed lines with a specific characteristic impedance. An algorithm is derived for the choice of the optimal values of the e.m.f.'s and the results of a confirming numerical analysis are shown graphically. B.W.

N85-33389# Joint Publications Research Service, Arlington, Va.
TRANSMITTER SPECTRUM ANALYZER Abstract Only **c35**
B. Stepanov and G. Shulgin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 10 Transl. into ENGLISH from Radio (Moscow), no. 9, Sep. 1983 p 17-21 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A spectrum analyzer for 7 MHz single-sideband transmitters of two tone signals at 1 and 1.8 kHz, respectively, on a 14,200 kHz carrier, has been developed as a means for monitoring the amplifier linearity and the intermodulation level. The instrument includes an adjustable attenuating resistor, a resistive decoupler, a ring mixer (KD503 or equivalent high-frequency silicon diodes) separated from the heterodyne stage (quartz oscillator and KP302 or KP303 field-effect transistor) by an emitter follower (KT312 or KT606 transistor), two low-pass filters (LC filter and second-order active filter using an operational amplifier), a low-frequency a.c. millivoltmeter using an operational ammplifier, a transformer (PEV-2/0.3 wire on ferrite ring core), a 50-200 microammeter, and a light-emitting indicator diode. Adjustment of the analyzer for operation begins with checking the performance of transistors in the d.c. mode, followed by trimming a LED resistor for threshold-sensitivity current, applying an audio signal, and oscillographically recording the amplitude-frequency characteristic, then applying a high-frequency signal. B.W.

N85-33390# Joint Publications Research Service, Arlington, Va.
MODULE FOR INTERFACING MICROPROCESSORS AND MICROCOMPUTER Abstract Only **c60**

G. Zelenko, V. Panov, and S. Popov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 10-11 Transl. into ENGLISH from Radio (Moscow), no. 9, Sep. 1983 p 32-35 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A module was developed for interfacing a digital magnetic sound recorder to a microcomputer so as to match a recording density of 32 bit/mm and a recording rate of 1500 bit/s. It has been designed for use with Romantik-306 recorders and MK-60-2 cassettes, but is also suitable for any other similar monophonic or stereophonic cassette-type recorders. Data are recorded on tape sequentially by the method of two-phase encoding. Data are played back by decoding, which involves bit identification and storage with program delay between processing of successive bits. The integrated microcircuit hardware of the module includes a pulse shaper (K589AP2B) coupling it to the data busbar at the last digit, an address decoder (K155LA2 and K155LYel), a D-trigger (K155TM2), an inverter (K155LYel) and a low-pass filter for recording, a low-pass filter and an operational amplifier (K14-OUD7) forming rectangular + or - 5 V pulses with a clipping (rectifying) diode at the output for reading into the microcomputer. Author

N85-33391# Joint Publications Research Service, Arlington, Va.
PREDICTING ELECTRICAL PERFORMANCE PARAMETERS OF UNDERWATER CABLES Abstract Only
G. A. Arkhangelskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 12 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 39-42 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Changes in the electrical performance parameters of underwater coaxial cables are predicted on the basis of the cable design parameters and the results of simulation tests. The procedure is demonstrated on a coaxial pair which had been designed with a compact dielectric filler and held four months in a laboratory tank under conditions simulating those at the sea bed, then reconstituted for further use. Increments of capacitance and the attenuation coefficient and decrements of inductances and the characteristic impedance are determined, with the aid of handbook reference data and taking into account the temperature factor. In the process are also determined the resistances of the cable conductors and the dielectric permittivity of the filler, according to standard relations. The accuracy of this algorithm is determined by and estimated as a function of measurement errors and dimensional errors. It thus depends on the main error and the temperature error of three measurements: capacitance and diameters of both cable conductors. B.W.

N85-33392# Joint Publications Research Service, Arlington, Va.
DESIGN OF DIGITAL BANDPASS FILTERS WITH FINITE MEMORY
V. V. Vityazev, S. I. Muravyev, and A. I. Stepashkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 16-24 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, 1983 p 3-9 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A method of designing digital bandpass filters with finite pulse characteristic, based on two- and multistage structures of digital comb filters, is proposed. The relationships between the parameters of the stages that permit minimization of the total calculating expenditures are found. Author

N85-33393# Joint Publications Research Service, Arlington, Va.
MAXIMALLY FLAT APPROXIMATION OF ATTENUATION CHARACTERISTICS OF COUPLED-LINE FILTERS Abstract Only
I. I. Trifonov and V. N. Salivon *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 25 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 31-34 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Coupled-line filters are structurally configured so that each internal line is coupled only to the two adjacent ones; the filter is thus equivalent to a cascade circuit of coupled lines connected in pairs. The transmission matrix of the entire network is found as the product of the transmission matrices of its individual cascaded sections. It is most convenient to utilize wave transmission matrices to describe the parameters of such filters. This approach is employed as the basis for a numerical method of solving the problem of approximating filter attenuation so that the response is maximally flat within the passband and isoextremal in the stopband. The derived algorithm always leads to physically feasible transmission matrix functions. The elements of the filter section conductance matrix are found by means of expanding a special form of the input conductance of the loaded network in a continued fraction. Author

N85-33394# Joint Publications Research Service, Arlington, Va.
MINIATURE TWO-MODE FILTERS Abstract Only
M. N. Berger, B. Yu. Kapilevich, and A. A. Ishchuk *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 25-26 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 33-35 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Significant miniaturization of band filters for such applications as digital radio relaying has been achieved by use of waveguide structures beyond cutoff with dielectric filler. Further miniaturization is possible by use of two-mode resonators based on such structures. The resonator is a segment of a waveguide with square cross section and a dielectric insert placed at the center equidistant from both ends. The dimensions of this insert and the dielectric characteristics of its material ensure propagation through it. The insert can cover the center cross section completely or partially, but it must be symmetric with respect to the plane at a 45 deg angle to the polarization plane of the excited mode. This will ensure identical condition for excitation of two mutually orthogonal modes within the space of one resonator. As a mathematical model for performance analysis, the filter can be treated as a pair of waveguide-dielectric resonators connected in series. The design is based on attaining maximum Q-factor, minimum insertion loss, and optimum frequency characteristics of the voltage standing wave ratio. Author

N85-33395# Joint Publications Research Service, Arlington, Va.
METHOD OF DESIGNING DIGITAL BAND-PASS FILTERS WITH PULSE RESPONSE OF FINITE DURATION Abstract Only
V. V. Vityazev, S. I. Muravyev, and A. I. Stepashkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 26 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 3-9 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A design method is proposed for narrow-band-pass filters with finite pulse response duration, such filters being used for digital processing of signals such as linear frequency selection. It is based on the use of 2-stage or multistage combs rather than on conventional direct convolution or on secondary discretization (decimation) with subsequent interpolation of output readings. In the 2-stage case the design reduces essentially to synthesis of an equivalent low-pass filter with appropriate frequency selectivity. The number of multiplications per discretization period, which decreases with decreasing bandwidth of the main stage but increases with decreasing bandwidth of the smoothing stage, can be reduced by successive addition of stages. Such filters can be realized with components of one type having identical pulse response characteristics and with a significant reduction of the noise level. The inevitable attendant nonuniformity of amplitude-frequency characteristics can be avoided by optimizing a 2-stage design instead. This method is free of errors inherent in order methods. Author

N85-33396# Joint Publications Research Service, Arlington, Va.
GENERALIZATION OF DISCRETE FOURIER TRANSFORM FOR INTERPOLATION IN TIME DOMAIN

V. A. Ponomarev and O. V. Ponomareva *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 27-30 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, 1983 p 67-69 Previously announced in IAA as A84-10221 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The construction of an algorithm for the fast calculation of the Fourier transformation of discrete sequences supplemented by zeros in the frequency domain is examined with reference to digital signal processing. The operation of an FFT algorithm for the calculation of an eight-point sequence is considered as an example. B.J.

N85-33397# Joint Publications Research Service, Arlington, Va.
OPTIMUM PREDISTORTION OF DIGITAL SIGNALS FOR TRANSMISSION OVER PARALLEL CHANNELS Abstract Only
L. M. Krasnov and V. K. Marigodov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 31 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 18-23 Previously announced in IAA as A84-10217 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The paper examines the synthesis of digital signals with optimal predistortion in parallel channels in the case when the principal speed-limiting factor is intersymbol interference, and the effect of fluctuation noise is negligible. The optimal form of the predistorted signal is determined, and the possibility of improving the transient response in the channels is demonstrated. It is shown that optimal predistortion in high-speed pipeline systems improves speed by increasing the signal amplitude and eliminates limitations imposed by the channels. B.J.

N85-33398# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF SIGNAL-TO-INTERFERENCE ENERGY RATIO IN DISCRETE-DATA TRANSMISSION Abstract Only c32
Yu. V. Arzumanyan and A. A. Zakharov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 32 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 23-29 Previously announced in IAA as A84-10218 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Algorithms of maximum-likelihood estimation of signal-to-noise ratio are developed for channels with a transmission coefficient that is constant in the estimation interval and for channels with Rayleigh fadings in the case of data transmission by orthogonal signals. Algorithms which are easy to realize and have an efficiency similar to that of the maximum-likelihood algorithms are examined. Results of the statistical simulation of the operation of the algorithms are discussed, and recommendations on the practical application of the results are presented. B.J.

N85-33399# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF DISCRIMINATION IN SOME INVARIANT SIGNAL TRANSFORMATIONS Abstract Only c32
B. A. Atayants and V. P. Rumyantsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 32-33 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 58-60 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The dependence of the discrimination efficiency on the form of invariant ignal transformation is evaluated in terms of the probability of identification error. Discrimination of two classes of signals is considered, after they have been transformed invariantly with respect to amplitude changes and after a delay equal to three instrument readings (decision based on first reading). The error of discrimination is compared with the estimate of the error probability, with functions of two nonstationary characteristics as parameters. These characteristics are expressed through dispersions of adjacent readings. Author

N85-33400# Joint Publications Research Service, Arlington, Va.
GENERALIZATION OF DISCRETE FOURIER TRANSFORMATION FOR INTERPOLATION IN TIME DOMAIN Abstract Only c64
V. A. Ponomarev and O. V. Ponomareva *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 33 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 67-69 Previously announced in IAA as A84-10221 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The construction of an algorithm for the fast calculation of the Fourier transformation of discrete sequences supplemented by zeros in the frequency domain is examined with reference to digital signal processing. The operation of an FFT algorithm for the calculation of an eight-point sequence is considered as an example. B.J.

N85-33401# Joint Publications Research Service, Arlington, Va.
OPTIMALITY CRITERION FOR HIGH-FREQUENCY CHANNEL IN RECEIVERS OF DISCRETE RADIO SIGNALS Abstract Only c32
V. V. Palshkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 34 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 71-72 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

An optimum receiver of discrete radio signals is defined as one without internal noise and nonlinear signal-interference interaction in its high-frequency channel. The interference level in such a channel determines the probability of detection error, and the larger than unity ratio of real-to-ideal error probability can be regarded as the optimality criterion for a real receiver in terms of inteference immunity. This ratio is an intricate function of receiver structure and performance indicators such as the forms of its amplitude-frequency and phase-frequency characteristics and the resolver threshold level. This relation becomes simpler in the case of low interference level and small detection error probability. Calculations based on characteristics of high-quality modern receivers indicate that nearly optimum reception is attainable through minimization of the ratio of real-to-ideal error probability. The feasibility has been demonstrated on a superheterodyne receiver. Author

N85-33402# Joint Publications Research Service, Arlington, Va.
CONTROLLABLE COMPANDING IN LOW-FREQUENCY FM RADIO COMMUNICATION SYSTEMS Abstract Only c32
E. S. Golovin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 34-35 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 73-75 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Decreasing the separation between adjacent channels is an effective way to better utilize the radio frequency spectrum for communication systems operating in the metric or decimetric wave bands. As the frequency separation is narrowed down to + or - 2.5 kHz in an FM telephone system, for instance, the loss in interference immunity becomes so appreciable that it becomes necessary to either increase the transmitter power or to reduce the service area. Here a remedy is proposed which restores the interference immunity by companding of the telephone signals. In one version of such an arrangement the telephone signal is resolved into two components, one going to the information channel and one going to the control channel. In the latter the signal envelope, i.e., signal amplitude variation is duplicated with the aid of an amplitude detector and contained within the 0-20 Hz range of the frequency spectrum. Author

N85-33403# Joint Publications Research Service, Arlington, Va.
GRADIENTAL ADAPTIVE CORRECTOR WITH OPTIMUM TUNING STEP Abstract Only

V. S. Mikhalchan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 35 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 85-87 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Gradiental harmonic band corrector with adaptive tuning through a gamma-function sequence is presented. An iterative algorithm of adaptive tuning is constructed according to the variational method, with use of the posteriori information which each iteration yields and with minimization of the mean-square deviation. A two-dimensional corrector input signal and the corrector output reading are each represented as projections of their respective cophasal and quadrature components. The deviations of these two components of the corrector output reading from those of the target reference reading are related to the deviations of these two components of the corrector input signal from those of the target reference reading and, on this basis, the adjustable corrector parameters on any iteration are determined from those on the preceding iteration by the method of steepest descent. The partial derivatives of the deviations, which appear in the expressions for these parameters, are evaluated by differentiation and inserted into the original expressions for the components of a corrector output reading. The convergence ratio of tuning step is then optimized for maximally attainable minimum mean-square deviation. Author

N85-33404# Joint Publications Research Service, Arlington, Va.
NONLINEAR FILTRATION OF CLUTTER Abstract Only
Zh. A. Sabirov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 36 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 87-89 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The problem of nonlinear filtration according to minimum mean-square error as a criterion is solved for a signal, appearing in an additive mixture with clutter and white noise. For synthesis of the nonlinear optimum filter, its characterizing continuous operator is expanded into a product of sums and a product. Minimization of the corresponding functional reduces the problem to a system of equations which yields the filter parameters and mean-square error. For illustration, the procedure is applied to filtration of a narrow-band signal appearing with a narrow-band non-Gaussian clutter and white noise. The energy advantage of the nonlinear optimum filter over the linear one increases power of the non-Gaussian clutter, but vanishes in the absence of white noise. Author

N85-33405# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF SYSTEM WITH NONIDEAL COMPONENTS FOR OPTIMAL PROCESSING OF RADIO SIGNAL Abstract Only **c32**
V. G. Tatarnikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 36-37 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 91-93 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Synthesis of a system with nonideal components for processing radio signals is considered, with nonideality of the characteristics being successively accounted for in the Kalman-Bussy equations. The optimum structure attainable with components of a given less than ideal quality is found on this basis. The procedure is demonstrated on processing an additive mixture of a random signal with uniform spectral density within some frequency band and a quasi-deterministic narrow-band interference with random parameters. The system which consists of two summators, six multipliers, and two integrators becomes an open one when the output voltage of the two integrators drifts in time. Replacement of ideal integrators with real ones is found to be equivalent to addition of another noise consisting of two independent Wiener processes. The equations are modified accordingly, and the optimum processing algorithm obtained on this basis. The structure of the system remains unchanged, but the transmission coefficient of the two multipliers before the integrators does not drop to zero so that the system remains closed during a transient. Author

N85-33406# Joint Publications Research Service, Arlington, Va.
ESTIMATING OPTIMUM TECHNICAL AND ECONOMIC INDICATORS OF DATA TRANSMISSION SYSTEMS Abstract Only **c32**
L. A. Shareyko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 38-39 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 45-48 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Selection of the technically and economically optimum design variant for planning or simulating a data transmission system necessitates determination of the optimum requirements for the various systems components. For solving this difficult problem, one must establish the pertinent relations between their parameters and how their cost depends on them. This is done by defining the appropriate criterion for cost effectiveness and constructing a mathematical model of the transmission channel. Subsequent calculations will yield the optimum variant accordingly, as is shown in the typical case of a Poisson distribution of the interference and exponential distributions of both the message lengths and the failure clearance time. It has been assumed in this illustrative example that the principle of noninterdependence applies to all nodal points of the system. Calculations cover the reasonable cost of ensuring reliability of the systems components. Author

N85-33407# Joint Publications Research Service, Arlington, Va.
DEVELOPMENTAL TRENDS IN RADIO RECEIVER DESIGN Abstract Only
N. I. Chistyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 41 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 9, Sep. 1983 p 33-36 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A historical review of the development of shortwave receiver design is followed by an enumeration of the characteristics of the state of the art in shortwave reception equipment: (1) the problem of band coverage, for example in marine receivers from 10 KHz to 30 MHz, has been resolved by the use of infradyne circuits with an IF of 40 to 80 MHz and a broadband preselector; such designs also make it possible to base the local oscillator on a phase-locked loop; (20 suppression of spurious frequencies is improved by placing them outside the working band through the use of a high first IF; (3) enhanced linearity of the broadband RF amplifier and converter has extended the dynamic range of receivers, and eliminated the need for a narrow band preselector with the use of simple suboctave filters and low pass filters at the input; and (4) the use of a decade frequency synthesizer based on a variable divisor frequency divider, highly stable master crystal oscillators, electronic varactor tuning of the local oscillator and Phase-locked loops provide for precise tuning to the requisite frequency, which is also improved by digital tuning and displays. A major aspect of present design work is the application of microprocessors to automatic tuning, programmed frequency setting and the performance of a variety of diagnostic functions in the receiver. Author

N85-33408# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF TESTS FOR PROGRAMMABLE LOGIC ARRAYS Abstract Only **c61**
A. Ye. Lyulkin and T. G. Pavlova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 46 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 299-305 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A computer-operational method of devising diagnostic tests is outlined, tests for inspection of programmable logic arrays for a certain class of faults. The synthesis of such tests is demonstrated

on an array which implements a set of three Boolean functions, the logic hardware consisting of MOS devices which perform negations of these functions so that in the general combinatorial case the array consists of two matrices: M1 performing H conjunctions of L literals and M2 performing negations of N corresponding disjunctions (a literal being any variable or its negation). The tuneup of such an array, defined as the set of states of connections between input and intermediate busbars in matrix M1 and between output and intermediate busbars in matrix M2, is described by M1 = (M sub ij sup 1) and M2 = (M sub ik sup 2) Boolean matrices, respectively. The problem of test synthesis is formulated as one of determining the set of individual faults detectable by a set of input signals. Author

N85-33409# Joint Publications Research Service, Arlington, Va.
DETECTION OF AND SEARCH FOR FAULTS IN PROGRAMMABLE LOGIC ARRAYS Abstract Only **c61**
M. B. Volynskiy and V. G. Novoselov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 47 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 306-312 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A procedure is proposed for diagnosis of programmable logic arrays which involves generating an inspection test on the basis of the functional description of the array, performing an experiment with this test, analyzing the results for extraction of primary diagnostic data, synthesizing supplementary sets of fault locating test signals, and performing a second diagnostic experiment for final fault search. The procedure is designed to minimize both the diagnosis time and the number of indistinguishable faults (faults causing identical responses at the output), which can be necessary because of the inherent functional redundancy in programmable logic arrays. Indistinguishability of faults is demonstrated on an array which performs a cubing function of three variables, the logic hardware consisting of bipolar devices. All detectable possible faults are classified into two groups, A faults 1 to 0 and B faults 0 to 1, caused by contraction or expansion of the cube or narrowing or widening of the function. On the basis of the respective causes characterizing single faults, algorithms A1,A2,C are constructed for search of A faults and algorithm B is constructed for search of B faults. All these algorithms have been formalized with an orientation toward programmable automatic inspection of large-scale-integration systems. Author

N85-33410# Joint Publications Research Service, Arlington, Va.
FILTRATION OF HIGHER HARMONIC COMPONENTS IN TWO-LEVEL DIGITAL COMPUTING SYNTHESIZERS Abstract Only **c60**
A. N. Fadeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 47-48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 29-33 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Digital computing synthesizers of 2-level signals, built with logic microcircuits, operate by forming pulses at the zero-crossovers of given harmonic oscillations and subsequently passing those pulses through a frequency divider. Under the worst conditions, filtration of higher harmonics is most necessary in the low-frequency range, the third harmonic being the one which most significantly distorts a quasi-meander wave. An analysis of filter performance in terms of ripple factor and attenuation reveals that filters with a large time constant are most suitable for this purpose, a Gaussian filter not being adequate here. Furthermore, rejection of parasitic harmonics is facilitated by connecting across the synthesizer output, before the low-pass filter, a multilevel encoder which generates a staircase approximation of a sine wave. The dependence of the ripple factor on the precision of the weighting resistors is evaluated, from the design standpoint, on the basis of the time correlation function and with the aid of the Khintchine-Wiener transformation. The results indicate that for adequate performance, the encoder must have more than four levels and the suppression level in the filter in the stop band needs only to be equal to the actual level of the second harmonic. Author

N85-33411# Joint Publications Research Service, Arlington, Va.
ART OF PROGRAMMING PROGRAMMABLE MICROCALCULATORS, PART 4: ERRORS OF CALCULATIONS Abstract Only **c60**
Ya. K. Trokhimenko and F. D. Lyubich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 48-53 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The errors of engineering calculations made on a programmable microcalculator are defined as absolute and relative, implying the maximum in each case. The accuracy of calculations is characterized by the number of correct significant figures in the decimal readout, in the narrow sense or in the wide sense (error not exceeding respectively half a unit of a whole unit of the last digital in the mantissa). The sources of errors are classified into operational ones such as limitation of the microcalculator and its memory as well as of the software and methodical ones. Operational errors are those of rounding by discard and rounding by complementation. A sensitivity analysis revealing the dependence of absolute and relative calculation error in elementary algebraic and transcendental (exponential-logarithmic, trigonometric) operations on the error of operands indicates the limits of accuracy ranges on programmable microcalculators operating in the YaMK21 or YaMK34 language. Author

N85-33412# Joint Publications Research Service, Arlington, Va.
EXAMINATION OF ANISOTROPIC FILMS BY RESONANCE METHOD Abstract Only
A. A. Vertiy, I. V. Ivanchenko, N. A. Popenko, Yu. P. Popkov, and V. P. Shestopalov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 49 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radiofiz. (Gorkiy), v. 26, no. 5, May 1983 p 616-624 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The dielectric characteristics of anisotropic thin films, namely their permittivity epsilon and difference delta epsilon were measured by the resonance method at short millimetric wavelengths. The theory of this method is based on the solution to the diffraction problem for a plane wave and a boundless dielectric layer, with appropriate boundary conditions for reflection and conditions of a self-conjugate resonance field. The practical application of the method is determination of the natural frequencies of an open resonator formed by plane mirrors and a dielectric layer perpendicular to the resonator axis. The expression or the critical distance between resonator plates was used for processing experimental data on various materials, including a few polymers such as polyethylene, isotropic for reference and made artificially anisotropic by oriented rolling. The minimum measurable anisotropy depends on the accuracy of readings of frequency separations between resonances and on the stability of the microwave test oscillator. A resonance-type polarimeter can be used for detecting and measuring the spectrum split in weakly anisotropic films. The error of delta epsilon determination for films of thickness $d > 0.005$ angstroms depends essentially on the accuracy of the thickness measurement. The error of epsilon determination for films of thickness $d < 0.025$ angstroms is on the order of 3% when the theoretical expression for an open resonator is used. Author

N85-33413# Joint Publications Research Service, Arlington, Va.
ESTIMATING ANGULAR POSITION OF OPTICAL RADIATION SOURCE WHEN RECEIVED BY ARRAY OF PHOTODETECTORS Abstract Only **c35**
L. D. Vilesov and V. N. Veys *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 50 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 85-87 (For primary document

see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The angular position of an optical radiation source is measured; its field is detected by an array of photodetectors in the focal (diffraction) plane of an optical antenna. The signal and background fields are of unknown intensity. The position is determined from the coordinates of the center of diffraction pattern of the signal field in the focal plane, assuming that each element of the array filters no more than one spatial, while the signal and background fields are both broadband and a Poisson model applies to the electron count fields when the radiation is detected. Similitude theory is used in order to derive an optimal estimate of the vector to the source and the special case where the radiation field is received by a four-element array is analyzed. It is shown that the covariation of the estimates of the coordinates is zero in the absence of background noise. The expressions provided permit the calculations of these optimal estimates when the diffraction pattern of the signal field does not coincide with the center of the array (nontracking meter) and there are no a priori data on the intensities of the signal and background noise fields. Author

N85-33414# Joint Publications Research Service, Arlington, Va.
KT3127A, KT3128A TRANSISTORS Abstract Only
N. Ovsyannikov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 51 Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1983 p 60 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The low-power silicon p-n-p type KT3127A, KT3128A transistors are intended or amplification, generation and conversion of high-frequency oscillations and automatic amplification control in television channel and radiochannel selectors. These planar epitaxial transistors in small metal-glass casings can be used in temperatures from -45 to 85 C and relative humidity of 98% or, without condensation, at a temperature of 40 + 2 C and can stand vibratory loads in the frequency range from 1 up to 600 Hz and acceleration up to 10 g, multiple impact loads with an acceleration of 75 g or linear loads with acceleration of 25 g. The transistor, with a mass which does not exceed 0.4 gr, is characterized by low capacity emitter and collector junction capacities, low noise levels in the high frequency ranges and sharp dependence of the amplitude coefficient on emitter current so that maximum power amplification is possible for emitter currents of 3...5 mA with attenuation of not less than 20 dB for 9 mA current. The principal electrical parameters of the transistors are presented with an environmental temperature of 25 + or - 10 C, and the maximum permissible operating conditions with a temperature from -45 up to +85 C. Author

N85-33415# Joint Publications Research Service, Arlington, Va.
TEMO AND TEB THERMOELECTRONIC DEVICES Abstract Only
P. Gassanov, G. Voytenko, and G. Voznaya *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 51 Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1983 p 59-60 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Reliable solid-state electronic microcoolers (TEMO) are being mass produced for thermostatic control of important radioelectronic circuits and can maintain necessary temperatures to fractions of a degree in the -60 to 60 C range. These devices consisting of sequences of p and n element semiconductors joined by copper plates, and with ceramic heat transfers, can withstand temperatures to 150 C. The units can be fitted together for specific needs and can utilize a battery stage (TEB) for additional power and can also function as a heater. Tellurium, bismuth, antimony and selenium semiconductor materials are used for TEMO and the best results were obtained with oriented polycrystals. The highly miniaturized elements are suitable for infrared receivers, lasers, materials research, thermosensor calibration, medical research, air conditioners and household coolers, and the like. The principal characteristics of the TEMO and TEB considered are presented. Author

N85-33416# Joint Publications Research Service, Arlington, Va.
DIGITAL TACHOMETER Abstract Only c35
B. Shirokov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 52 Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1983 p 28-29 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A tachometer with digital indication was built for measuring the speed of automobile engines with only two digits in the rpm readout. It consists of a Schmitt trigger for shaping input pulses, a pulse counter, a cycle time setting multivibrator and a readout time setting multivibrator, a stabilizer, a flicker suppressor, and a capacitive transducer. The instrument operates from a 12 V battery and draws 180 mA. The transducer includes a 30 to 50 turns coil of PEL 0.5 wire wound around the conductor which connects the ignition coil to the engine distributor and its transistor is mounted on a fin-type heat sink. Tuneup of the tachometer involves matching the transducer capacitor for maximum voltage at minimum current and trimming the readout time setting multivibrator with its adjustable resistor for a 1.5 readout with a 50 Hz input signal. E.A.K.

N85-33417# Joint Publications Research Service, Arlington, Va.
GENERAL DESIGN PRINCIPLES OF HIGH SPEED FREQUENCY SYNTHESIZERS BASED ON PHASE SYNCHRONIZATION SYSTEMS Abstract Only c35
V. V. Shakhgildyan, A. V. Pestryakov, and A. I. Kabanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 52-53 Transl. into ENGLISH from Elektrosvyaz' (Moscow), no. 10, Oct. 1983 p 36-42 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The problem of boosting synthesizer speed by increasing the signal comparison rate in digital Phase-locked loops (PLL) is examined. The following synthesizer configurations are discussed in a nonmathematical treatment: (1) frequency synthesizers using dividers with a variable fractional divisor; (2) synthesizers based on a pulse PLL, which utilize approximation frequency synthesis algorithms; (3) synthesizers utilizing a linear transformation of the step of the frequency grid; (4) synthesizers based on pulse PLL systems using a coarse setting accelerating input to control the tunable oscillator; (5) frequency synthesizers which use the change in the characteristics of the control circuit in the loop; and (6) those which make use of the establishment of favorable phase relationships with the incorporation of a PLL. Optimal control techniques make it possible to increase synthesizer speed by approximately an order of magnitude, however, they are not widely used because of the complex computations which must be performed rapidly, because it is necessary to keep the PLL parameters constant with a high degree of precision. As the component base is refined, it is anticipated that optimal control methods will be more extensively utilized in frequency synthesizer design. E.A.K.

N85-33418# Joint Publications Research Service, Arlington, Va.
STRONGLY COUPLED MILLIMETER-BAND WAVEGUIDE DIRECTIONAL COUPLERS Abstract Only c32
A. N. Akhiyezer *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 54 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 8-11 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A design technique for directional couplers, coupled through a central partition with holes paralleling the wide wall, is generalized for the case of strong coupling with 0 to 10 dB separation between the waveguides. The wave amplitude due to splitting with the propagation of the wave along the coupling system is considered; this coupling region is broken down into cascaded symmetrical sections where the phase constant is assumed to be the same in both waveguides. Analytical expressions are derived for the crosstalk attenuation between the channels, the insertion loss of the main channel and the directivity. Experimental data and values

calculated using the derived formulas are compared. Both couplers can be disassembled and the partioning plate with the coupling holes and the walls are nickel plated. The agreement between experimental and calculated data is good with the formulas being applicable to programmable calculators. E.A.K.

N85-33419# Joint Publications Research Service, Arlington, Va.
APPLICATION OF FIELD SIMILITUDE THEORY TO CALCULATION OF STRIPLINE HEATING Abstract Only
Yu. Ya. Yurov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 55 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 34-38 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The ultimate power which can be transmitted by a stripline on a dielectric substrate is governed by the dielectric temperature. The similitude between the thermal and electrical fields was used to calculate the maximum temperature of the dielectric. The potential distribution satisfies a Laplace equation, while the temperature distribution is determined by Poisson's equation, so that complete similitude cannot be attained. Similitude functions are derived to relate the electrostatic potential in the transverse plane of a stripline and a certain auxiliary function. The electrothermal potential is a function, both of the temperature and the electrostatic potential, which satisfies Laplace's equation, making it possible to circumvent the difficulty noted above. It is assumed that: (1) the dielectric parameters are independent of the temperature and spatial coordinates; (2) test transfer is considered only in the transverse direction and longitudinal heat transfer is negligible; (3) metal surfaces, because of their considerable heat conductivity, are assumed to be isothermal; and (4) the temperature distribution is considered to be steady state. A simple analytical expression is derived for the optimum characteristic impedance of a stripline used for power transmission. E.A.K.

N85-33420# Joint Publications Research Service, Arlington, Va.
FUNDAMENTALS OF RADIO OPTICAL THEORY OF RESONANT AND DIRECTIONAL QUASI-OPTICAL DEVICES Abstract Only
Yu. A. Pokrovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 55-56 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 42-48 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The principles of a theory in which preference is given to approximate physical models which allow for a rigorous but simple analytical description is analyzed. The spectral theory of devices for shaping wave bundles with low angular divergence utilizes an integral equation for the eigenfunctions which is reduced to an algebraic equation for the inherent angular spectrum of a Riemannian boundary value problem. The devices are open resonators, open waveguides, and open resonators and waveguides with resonant angular spectrum correctors. The structural design of an open resonator with a specified distribution of the fundamental mode is discussed. The principle of equal local eigenvalues can be used to approximate such cavities with a specified fundamental resonator cavities with the selection of any transverse mode. E.A.K.

N85-33421# Joint Publications Research Service, Arlington, Va.
WAVEGUIDE DIELECTRIC MILLIMETER BAND FILTER WITH ENHANCED SELECTIVITY Abstract Only
A. R. Bondarenko, V. I. May, L. S. Nazarenko, and V. V. Senchenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 56 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 61-62 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The structural design of a waveguide dielectric filter which can be used at the input to a low noise mixer and meet the requirements placed on the selectivity, while assuring low losses within the passband was analyzed. The case of the H sub 01 mode incident on a layered dielectric structure in a rectangular waveguide is considered. Expressions are derived for the transmission gain and reflection factor, and the input impedance of the system of coupled dielectric resonators. Curves are plotted from theoretical and experimental data to show the voltage standing wave ratio and attenuation as a function of frequency for such filters which consist of seven quartz, polikor or ceramic resonators. These waveguide dielectric filters are composed of a set of hollow waveguide sections in which the dielectric resonators metallized on the end faces are press fitted in a definite sequence. A variation in the dielectric permittivity and length of the coupled waveguide sections of 3 to 4%, or even the thickness of the dielectric resonators by 0.5% has no significant impact on the filter response. E.A.K.

N85-33422# Joint Publications Research Service, Arlington, Va.
CALCULATING DOMINANT (QUASI-t) MODE GROUP VELOCITY IN SHIELDED MICROSTRIP LINE Abstract Only **c66**
K. K. Valuyev, Yu. A. Ilarionov, and V. Ya. Smorgonskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 57 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 70-72 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

A technique utilizing singular integral equations to arrive at a dispersion expression for a shielded microstrip line is discussed. The dispersion equation was solved on a BESM-4 computer for the normalized longitudinal wave number as a function of the frequency, after which the derivative of this wave number with respect to frequency was calculated along with the normalized group velocity. The results are plotted for the simple microstrip configuration. The group velocity plotted as a function of frequency exhibits pronounced minima coinciding with the inflection points of the dispersion characteristics. The existence of this minimum is explained and the retardation factor and group velocity are also graphed as a function of the frequency and t/L. The latter curves show that with an increase in t/L, the inflection point of the dispersion characteristics and the group velocity minimum coinciding with it are shifted in the direction of lower frequencies. A simple expression is given for the minimal retardation. The minimal retardation initially rises with an increase in the conductor width and then falls off, tending to unity as t/L 1. E.A.K.

N85-33423# Joint Publications Research Service, Arlington, Va.
STUDY OF NONLINEAR DISTORTION IN MICROWAVE AMPLIFIERS USING SCHOTTKY GATE FIELD EFFECT TRANSISTORS Abstract Only
M. V. Gromov and G. V. Petrov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 57-58 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 81-83 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The use of transistor S-parameters, measured at various input signal levels is outlined. The application of this method to the design of a MESFET narrowband amplifier is described. The nonlinear S parameters served as the initial data for designing the topologies of two narrowband amplifiers. After the geometry of the matching gamma section networks using microstrip lines was determined, a transistor was matched in one instance for the small signal case, where its S-parameters corresponding to an input power of 0.1 mW were used, while in the other case, the matching was accomplished for an input power of 1.5 mV. The amplifier characteristics were calculated in the input power range at 6 GHz. Curves are plotted showing the amplifier gain and phase of the gain as a function of the input signal power for the case when the amplifier is tuned for a maximum small signal gain, and also for a maximum large signal gain. The third order intermodulation distortion was calculated for these two amplifiers, when two frequencies are fed to the input. The intermodulation distortion was also calculated for a balanced amplifier, in which two amplifier stages tuned for a small signal were used. This circuit provides a significant reduction in the intermodulation signal level. E.A.K.

N85-33424# Joint Publications Research Service, Arlington, Va.
PHOTOTHYRISTOR OPTRONS AND OPTRON MICROCIRCUITS, PART 1 Abstract Only
In its USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 58-59 Transl. into ENGLISH from Radio (Moscow), no. 9, Sep. 1983 p 57-60 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

An optron is a device for transmission of electric signals which are converted to optical signals and subsequent reconverted to electric signals. A photothyristor optron consists of two discrete galvanically isolated and optically direct coupled components in a common housing: emitter and photothyristor. Its output stage is a four layer silicon device and its emitter is an infrared GaAs diode. With a d.c. voltage across the photothyristor electrodes and zero diode current, the photothyristor is in a nonconducting state with only a small leakage current in the output circuit. The performance parameters of thyristor optrons are classified into input parameters, intermediate parameters, and output parameters. Three series of thyristor optrons are produced. They are used for galvanic isolation of logic circuits from inductive loads, for control of thyristors and semistors, for pulse shaping, as voltage monitors and for protection of secondary power supplies, as commutator switches for indicator lamps and for matching control circuits to indicator panels. They are desined to operate with functional integrated microcircuits. All these microcircuits are enclosed in metal glass housings. E.A.K.

N85-33425# Joint Publications Research Service, Arlington, Va.
MULTIDIODE INTEGRATED-CIRCUIT PROTECTIVE DEVICE Abstract Only
Ye. I. Kuptsov and V. P. Trofimov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 59 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 83-85 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Asymmetric microstrip transmission lines on dielectric substrates can carry 100 W in the continuous wave mode and 1 kW or more in the pulse mode, which is much more than the power rating of solid state integrated microwave devices. Compounding of such devices raises the overall efficiency of the system. When a microstrip line is used as a protective device for a microwave switch, its capacity can be further increased by local insertion of a symmetric microstrip segment so that twice as many diodes can be connected. A typical 8 diode device can be produced by deposition of a grounding base on each of two substates, with a window in the conductive coating in each. In these windows identical conducting strips are deposited, whereupon diodes are connected between the ends of these strips and the respective base. Blocking capacitors and bias circuits are added, two conducting pins which connect the two grounding bases of this symmetric microstrip line providing the transition to the asymmetric one, and other conducting pins are added for suppression of parasitic resonances. E.A.K.

N85-33426# Joint Publications Research Service, Arlington, Va.
PULSED LASERS FOR FILMING COLOR HOLOGRAPHIC FILM IMAGES Abstract Only **c36**
V. G. Komar and V. N. Sokolov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 61 Transl. into ENGLISH from Tekh. Kino i Televideniya (Moscow), no. 9, Sep. 1983 p 32-36 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Published work is surveyed in which prespective directions for improving laser light sources for holographic motion pictures and graphic holography with a color three dimensional image are outlined. The paper is divided into three parts: (1) principles of laser selection; (2) solid state lasers; and (3) dye lasers. E.A.K.

N85-33427# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF METRICO-TOPOLOGICAL MODEL FOR LAYOUT OF TOPOLOGY OF LARGE-SCALE-INTEGRATION ARRAYS Abstract Only
V. M. Kureychik, V. A. Kalashnikov, and Ye. V. Nuzhnov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 62 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 291-298 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Design of the topology layout is the crucial item in the large-scale-integration (LSI) process. The main difficulty in automated design of LSI arrays is the large number of factors which must be considered. Construction of a general model of the arrangement and interconnection of the topology fragments is proposed. The basic aim is to establish favorable conditions for the next step of the design process; optimizing the interconnections. The spacing of topology fragments is varied and the optimum variant is sought, the generalized criterion is the minimum total length of interconnections. The procedure involves pairwise permutations of components, trial permutations continuing until the difference between the widths of interstitial zones becomes minimum. A two-step construction of an orthogonal Steiner tree for the last step of the design process follows: dimensioning the topology layout and separation of tiers superposed on the drawing. This method takes into account structural and technological factors in cellular layout, provides for control of the chip structure, does not require fixation of fragments, and monitors changes in quality during optimizing iterations. E.A.K.

N85-33428# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF HIGH-SPEED DEVICES USING INTEGRATED OPERATIONAL AMPLIFIERS Abstract Only
T. M. Agakhanyan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 63 Transl. into ENGLISH from Mikroelektron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 313-319 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Integrated operational amplifiers include corrective networks preventing self-excitation but also reducing the speed. It is necessary to ensure the minimum speed reduction for the networks. This imposes stringent constraints on the transient response characteristics such as maximum permissible rise time and overshoot amplitude, and on the corner frequency and the nonuniformity of the amplitude or phase-frequency characteristic. These requirements are examined quantitatively by the method of transfer functions in feedback systems. In the synthesis of such a device, one must strive for a characteristic equation with real roots for the transfer function of the feedback loop and one with the largest possible imaginary parts of the complex roots for the amplifier again. For complete matching of design with performance requirements, the corrective network must have as many loops and degrees of freedom as there are equations, A corrective network which has no zeros and does not raise the degree of the characteristic equation is designed for operation of this amplifier under a large capacitive load. With stray shunting capacitances at the output and with slow power transistors, this operational amplifier must be described by a transfer function with three poles. Numerical values of the various parameters are obtained on this basis. E.A.K.

N85-33429# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF OPTICAL INFORMATION-MEASUREMENT CHANNELS WITH UTILIZATION OF SCATTERING EFFECTS Abstract Only **c74**
S. I. Bychkov, V. N. Pavlov, and M. M. Shevyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 64 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 10-14 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

Optical channels which utilize scattering effects for measurement and data transmission are considered, a typical one is a spatially bounded laser beam which propagates through the atmosphere, and its main advantage is that the photoreceiver aperture need not be illuminated from the transmitter directly. The frequency characteristic of such a channel and the space-time

characteristics of such signals are calculated for the basic configuration with a pencil-beam source and an offset receiver. On the basis of expressions for the photodetector current and the dispersion of normal joint signal-noise distribution, the aperture function of the receiver antenna and the postphotodetection channel are optimzized for a maximum signal-to-interference power ratio at the input to the threshold device. It is shown that a rectangular aperture function is the optimum one and that the signal-to-interference power ratio increases montonically with an increasing angle of vision, but only as long as the latter does not exceed the angular dimensions of the laser pencil beam. E.A.K.

N85-33430# Joint Publications Research Service, Arlington, Va.
BINARY SIGNAL DETECTION IN ACOUSTOOPTIC RECEIVERS **c71**

A. V. Pugovkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 65-68 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, 1983 p 75-77 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The noise stability of acoustooptic (AO) frequency meter-receivers (AOPCh) and spectral analyzers (AOAS) was considered. The probability of signal detection in the frequency channels of the receivers was found in approximation of a normal random process at the input of the threshold device. The method of calculating the statistical characteristics for the intensity of diffracted light and subsequent finding of the detection characteristics by normalization of the process was used. A method of solving this problem is proposed in which the characteristics of the random process at the input of the device are given their conversions upon passage through the main components are considered. With this approach the model of the normal process can be omitted. E.A.K.

N85-33431# Joint Publications Research Service, Arlington, Va.
ASYMMETRY OF DIFFRACTION ORDERS WITH LIGHT DIFFRACTION AT SURFACE ACOUSTIC WAVE Abstract Only **c71**

V. B. Voloshinov, V. N. Parygin, and N. S. Tankovski *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 69 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Sep. 1983 p 38-42 Previously announced in IAA as A83-45681 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The diffraction of a light beam by a surface acoustic wave is analyzed for the case of transverse interaction between the light beam and the acoustic wave. Diffraction intensities for the first two diffraction orders are calculated and determined experimentally as a function of the light beam with respect to the acoustic wave. The asymmetry of the diffraction pattern is investigated at a frequency of 340 MHz. V.L. (IAA)

N85-33432# Joint Publications Research Service, Arlington, Va.
MEAN INTENSITY OF WAVE REFLECTED BY WAVEFRONT REVERSING MIRROR IN TURBULENT MEDIUM Abstract Only **c74**

A. N. Malakhov, A. V. Polovinkin, and A. I. Saichev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 71 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radiofiz. (Gorkiy), v. 26, no. 5, May 1983 p 579-586 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

The mean intensity of a wave after its reflection by a wavefront reversing mirror in a turbulent medium is calculated. Both waves are described in a low-angle quasioptical approximation, the incident wave originating from a point source. The medium is assumed to be stationary. It is shown that over short routes the mean intensity of the reflected wave is equal to its intensity in a vacuum. Over long routes, however, the profile of the mean intensity depends on the mirror size. Large mirrors fully compensate the effect of turbulence. Medium size mirrors produce a profile which has a narrow peak with a radius equal to the coherence radius and a low but wide pedestal covering most of the wave cross section. The mean intensity of a wave reflected by a small mirror is equal to that of a wave reflected by a plain mirror of the same dimensions. Mirrors with a characteristic dimension such larger than the coherence radius always amplify the wave intensity at the source point. E.A.K.

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-33433* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VORTEX GENERATING FLOW PASSAGE DESIGN FOR INCREASED FILM COOLING EFFECTIVENESS Patent

S. Stephen Papell, inventor (to NASA) Issued 16 Jul. 1985 8 p Filed 15 Feb. 1984 Supersedes N84-20782 (22 - 11, p 1652)
(NASA-Case-LEW-14039-1; US-Patent-4,529,358; US-Patent-Appl-SN-580419; US-Patent-Class-416-97A; US-Patent-Class-415-115) Avail: US Patent and Trademark Office CSCL 20D

It is an object of the invention to provide a film cooling apparatus of increased effectiveness and efficiency. In accordance with the invention, a cooling fluid is injected into a hot flowing gas through a passageway in a wall which contains and is subject to the hot gas. The passageway is slanted in a downstream direction at an acute angle to the wall. A cusp shape is provided in the passageway to generate vortices in the injected cooling fluid thereby reducing the energy extracted from the hot gas for that purpose. The cusp shape increases both film cooling effectiveness and wall area coverage. The cusp may be at either the downstream or upstream side of the passageway, the former substantially eliminating flow separation of the cooling fluid from the wall immediately downstream of the passageway.

Official Gazette of the U.S. Patent and Trademark Office

N85-33434# Los Alamos National Lab., N. Mex.
KRAK: A COMPUTER PROGRAM FOR TWO-PHASE TWO-COMPONENT POROUS FLOW AND FRACTURE

B. J. Travis, A. H. Davis, T. D. Kunkle, R. G. Deupree, and Glenda Ponder, ed. Sep. 1984 99 p Sponsored in part by DNA
(Contract W-7405-eng-36)
(LA-9703) Avail: NTIS HC A05/MF A01

The KRAK code models the mass, momentum, and energy flow of steam, liquid water, and a noncondensable gas in a porous medium. It can model the initiation and propagation of hydrofracture in this medium by any or all of the fluid components using finite difference techniques. The interaction of the flow and the cracking is self-consistently performed. Flow in the crack is treated by a full-momentum equation, which allows rapid fracturing. The code was used in studies of the underground containment of radioactive gases produced by nuclear explosions and of siting underground nuclear power reactors. The code could also be applied to a wide variety of geophysical situations such as geothermal energy extraction, geysers, convection in a fractured medium, and explosive well stimulation. The physical model includes heat transfer between the porous medium and the flowing fluid, an equation of state of fluid condensation and evaporation, a model for the viscosity of each fluid component and the composite viscosity, and a permeability model that treats interfaces of greatly differing permeabilities. Cracking is controlled by a simple fracture mechanics model. E.A.K.

N85-33435*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOCAL HEAT-TRANSFER MEASUREMENTS ON A LARGE,

SCALE-MODEL TURBINE BLADE AIRFOIL USING A COMPOSITE OF A HEATER ELEMENT AND LIQUID CRYSTALS
S. A. Hippensteele, L. M. Russell, and F. J. Torres 1985 21 p refs Presented at the 30th Intern. Gas Turbine Conf. and Exhibit, Houston, Tex., 17-21 Mar. 1985; sponsored by ASME
(NASA-TM-86900; E-2347; NAS 1.15:86900) Avail: NTIS HC A02/MF A01 CSCL 20D

Local heat transfer coefficients were experimentally mapped along the midchord of a five-time-size turbine blade airfoil in a static cascade operated at room temperature over a range of Reynolds numbers. The test surface consisted of a composite of commercially available materials: a mylar sheet with a layer of cholesteric liquid crystals, that change color with temperature, and a heater sheet made of a carbon-impregnated paper, that produces uniform heat flux. After the initial selection and calibration of the composite sheet, accurate, quantitative, and continuous heat transfer coefficients were mapped over the airfoil surface. The local heat transfer coefficients are presented for Reynolds numbers from 2.8 x 10 to the 5th power to 7.6 x 10 to the 5th power. Comparisons are made with analytical values of heat transfer coefficients obtained from the STAN5 boundary layer code. Also, a leading edge separation bubble was revealed by thermal and flow visualization. Author

N85-33436*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A MIXED PSEUDOSPECTRAL/FINITE DIFFERENCE METHOD FOR A THERMALLY DRIVEN FLUID IN A NONUNIFORM GRAVITATIONAL FIELD
Michele G. Macaraeg Jul. 1985 10 p refs Presented at the AIAA 18th Fluid Dyn. and Plasmadyn. and Lasers Conf., Cincinnati, 16-18 Jul. 1985
(NASA-TM-87581; NAS 1.15:87581) Avail: NTIS HC A02/MF A01 CSCL 20D

A numerical study of the steady, axisymmetric flow in a heated, rotating spherical shell is conducted to model the Atmospheric General Circulation Experiment (AGCE) proposed to run aboard a later shuttle mission. The AGCE will consist of concentric rotating spheres confining a dielectric fluid. By imposing a dielectric field across the fluid a radial body force will be created. The numerical solution technique is based on the incompressible Navier-Stokes equations. In the method a pseudospectral technique is based on the incompressible Navier-Stokes equations. In the method a pseudospectral technique is used in the latitudinal direction, and a second-order accurate finite difference scheme discretizes time and radial derivatives. This paper discusses the development and performance of this numerical scheme for the AGCE which has been modelled in the past only by pure FD formulations. In addition, previous models have not investigated the effect of using a dielectric force to simulate terrestrial gravity. The effect of this dielectric force on the flow field is investigated as well as a parameter study of varying rotation rates and boundary temperatures. Among the effects noted are the production of larger velocities and enhanced reversals of radial temperature gradients for a body force generated by the electric field. Author

N85-33437# Wisconsin Univ., Madison. Mathematics Research Center.
FINITE ELEMENT METHODS FOR VISCOELASTIC FLOW Technical Summary Report
D. S. Malkus Apr. 1985 32 p
(Contract DAAG29-80-C-0041; Grants NSF MCS-79-03542; NSF MCS-81-02089; NSF MCS-83-01433)
(AD-A154877; MRC-TSR-2812) Avail: NTIS HC A03/MF A01

Finite element methods to compute approximate solutions to flow problems involving the flows of viscoelastic fluids are discussed. The primary goals of such investigations are at least three: First, to evaluate the predictions of the many proposed constitutive theories for viscoelastic fluids. Second, to model measurement flows in various rheological measurement devices in order to quantify the deviation of the actual flow from the flow which must be presumed to interpret the measurement. Third, it is hoped that these methods will prove sufficiently robust to allow the simulation of idealized polymer processes with the aim of aiding in the design of such processes and the required apparatus. The focus of the current research of the author and a growing number of others is on two-dimensional, isothermal, steady flows of incompressible fluids. While these restrictions will be seen to be non-essential in theory, even the simplest calculations of non-visometric flow solutions will be seen to require a high degree of computational complexity in practice. Nevertheless, the current finite element procedures seem to show promise in the continuing endeavor to understand this challenging class of problems. GRA

N85-33438# Department of Energy, Washington, D. C.
DRYING OF PULVERIZED MATERIAL WITH HEATED CONDENSIBLE VAPOR Patent Application
L. W. Carlson, inventor (to DOE) (Argonne National Lab., Ill.) Filed 16 Aug. 1984 21 p
(Contract W-31-109-eng-38)
(DE85-011656; US-Patent-Appl-SN-641222) Avail: NTIS HC A02/MF A01 CSCL 20D

Apparatus for drying pulverized material utilizes a high enthalpy condensable vapor such as steam for removing moisture from the individual particles of the pulverized material. The wet particulate material is delivered by a carrier vapor flow to an upper portion of a separation drum. The lateral all of the drum is provided with flow guides for directing the vapor in the direction of particulate material flow. Positioned concentrically within the separation drum and along the longitudinal axis is a water cooled condensation cylinder provided with collection plates, or fines. The cooled collection fines are aligned counter to the flow of the pulverized material and high enthalpy vapor mixture to maximize water vapor condensation. The condensed liquid then flows downward along the outer surface of the coolant cylinder and is collected and removed. The particles of the pulverized material are directed outwardly by the vortex flow where they contact the inner cylindrical surface of the separation drum and are deposited at the bottom for easy collection and removal. The pulverized material drying apparatus is particularly adapted for drying coal fines and facilitates the recovery of the pulverized coal. DOE

N85-33439# Department of Energy, Washington, D. C.
WOVEN HEAT EXCHANGER Patent Application
R. R. Piscitella, inventor (to DOE) (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho) Filed 16 Jul. 1984 20 p
(Contract DE-AC07-76ID-01570)
(DE85-011633; US-Patent-Appl-SN-649772) Avail: NTIS HC A02/MF A01 CSCL 20D

A heat exchanger for waste heat recovery from high temperature industrial exhaust streams is discussed. In a woven ceramic heat exchanger using the basic tube-in-shell design, each heat exchanger consisting of tube sheets and tube, is woven separately. Individual heat exchangers are assembled in cross-low configuration. Each heat exchanger is woven from high temperature ceramic fiber, the warp is continuous from tube to tube sheet providing a smooth transition and unitized construction. DOE

N85-33440# Department of Energy, Washington, D. C.
HEAT SINKING FOR PRINTED CIRCUITRY Patent Application
S. K. Wilson, G. Richardson, and A. L. Pinkerton, inventor (to DOE) Filed 11 Sep. 1984 8 p
(Contract W-7405-eng-36)
(DE85-011585; US-Patent-Appl-SN-649322) Avail: NTIS HC A02/MF A01 CSCL 20D

A flat pak or other solid-state device mounted on a printed circuit board directly over a hole and which extends through so that the bottom of the pak or device extends beyond the bottom of the circuit board is discussed. A heat sink disposed beneath the circuit board contacts the bottom of the pak or device and provides direct heat sinking thereto. Pressure may be applied to the top of the pak or device to assure good mechanical and thermal contact with the heat sink. DOE

N85-33441# Southern California Gas Co., Los Angeles.
HEAT-MASS FLOW ENHANCEMENT SYSTEM FOR A METAL

HYDRIDE ASSEMBLY Final Report
T. A. Argabright (Solar Turbines, Inc., San Diego, Calif.) Feb. 1985 67 p
(Contract DE-AC02-76CH-00016)
(DE85-010698; BNL-51864) Avail: NTIS HC A04/MF A01

Southern California Gas Company and Solar Turbines Incorporated are cooperating in the development and demonstration of a metal hydride/chemical heat pump (MHHP). In the design of the MHHP, heat transfer was considered to be the key technical study area. The goal of this effort is improved heat transfer and reduced thermal mass in a hydride heat exchanger/containment assembly. Phase 1 resulted in the detailed design of an advanced hydride heat exchanger. Phase 2 consisted of the experimental verification of the hydride alloy design data, fabrication of the hydride heat exchanger module components, heat transfer testing of the single heat exchanger element and preliminary performance testing of the entire module. Phase 3 was devoted to the complete characterization of the hydride heat exchanger modules through further operation and testing. A review of other possible hydride heat transfer concepts was also conducted in Phase 2. DOE

N85-33442# California Univ., Livermore. Lawrence Livermore Lab.
TWO-DIMENSIONAL SIMULATION OF INSTABILITY GROWTH DUE TO SHOCKS
W. P. Crowley 1 May 1985 34 p refs
(Contract W-7405-eng-48)
(DE85-011869; UCID-20418) Avail: NTIS HC A03/MF A01

The 2D Lagrangian calculations of impulsively driven instabilities in compressible fluids. The results of four problems are reported. In the first two, the first shock crosses the perturbed interface in a direction from heavy to light. During the shock passage, the interface thinks it is stable and starts to oscillate but once the shock has delivered its impuse and moved away, the interface realizes its error and the perturbation continues to grow with a constant velocity. The result of this is a phase reversal of the perturbation amplitude during the first shock. Following this is a succession of shocks which are different in the two problems due to a change in boundary conditions. In the last two problems, the first shock crosses the perturbed interface in a direction from light to heavy, and the perturbation amplitude grows with time after first being decreased by the shock compression. Later in time a heavy to light shock crosses the interface, and again the interface goes through a phase reversal. DOE

N85-33443# California Univ., Livermore. Lawrence Livermore Lab.
GRADIENT SCALING FOR NONUNIFORM MESHES
L. G. Margolin, H. M. Ruppel (LASL), and R. B. Demuth (LASL) 1985 13 p refs Presented at the 4th Intern. Conf. on Numerical Methods in Laminar and Turbulent Flow, Swansea, England, 8 Jul. 1985
(Contract W-7405-eng-36)
(DE85-009625; LA-UR-85-1049; CONF-850745-7) Avail: NTIS HC A02/MF A01

The effect of nonuniform meshes on the accuracy of finite-difference calculations of fluid flow is discussed. In particularly, when a simple shock propagates through a nonuniform mesh, one may fail to model the jump conditions across the shock even when the equations are differenced in manifestly conservative fashion. An approximate dispersion analysis of the numerical equations is developed and the source of the mesh dependency is identified with the form of the artifical viscosity. An algebraic correction to the numerical equations is then identified a scaling factor for the pressure gradient to essentially eliminate the mesh dependency. Author

N85-33444# Stanford Univ., Calif. Geothermal Program.
LINEAR BOUNDARY DETECTION USING PRESSURE BUILDUP TESTS
G. Fox Jun. 1984 48 p
(Contract DE-AT03-80SF-11459)
(DE85-009926; SU-SGP-TR-83) Avail: NTIS HC A03/MF A01

Linear boundary detection has received considerable attention in the past. Although linear boundaries are frequently suspected and observed in well tests, conventional interpretation methods rely upon the development of two straight lines, which may not occur in practice. This report introduces two new semilog type curve matching methods for finding the distance to linear boundaries using buildup tests. Idealized curves are plotted from analytical solutions generated using the image well concept. These curves are then collapsed mathematically to a single type curve. By matching field data to the semilog type curve, the distance to a linear boundary may be estimated. The new methods have distinct advantages. The transition zone is the most important feature of the pressure response for type curve matching. Since development of the second straight line is not required, the range of interpretable tests is greatly extended. No estimates of reservoir characteristics are required to calculate the distance to the boundary because dimensionless parameters are used. DOE

N85-33445# Sandia Labs., Albuquerque, N. Mex.
PRELIMINARY CONSIDERATIONS FOR THE GASDYNAMIC PRECOMPRESSION OF SOLID MOLECULAR HYDROGEN
L. M. Barker, T. G. Trucano, J. R. Asay, and J. L. Wise Mar. 1985 74 p refs
(Contract DE-AC04-76DP-00789)
(DE85-013256; SAND-85-0111) Avail: NTIS HC A04/MF A01

A preliminary examination of the feasibility of quasi-isentropically compressing solid or liquid molecular hydrogen to multi-megabar pressures by means of a gas-cushioned projectile impact experiment is presented. The primary purpose for using a gas-cushioned projectile is to prevent large temperature increases in the sample. Initial experimental design concepts, and a series of one-dimensional Lagrangian computations that demonstrate the feasibility of the experimental concepts are presented. The expected temperature rises in the hydrogen sample undergoing continuous compression are briefly discussed and contrasted with the temperature rises expected in direct shock loading. This experimental procedure will allow the acquisition of very high pressure data which are beyond the range of diamond-anvil cell technology. Since the estimated peak presusres of the experiment are within theoretical predictions of the metal-insulator transition in molecular hydrogen, the proposed experiment will directly probe the existence of this transition. The molecular-to-metallic transition in hydrogen is a subject of current importance in solid-state physics. DOE

N85-33446# Los Alamos Scientific Lab., N. Mex.
PULSED HYDROJET PROPULSION
I. O. Bohachevsky and M. D. Torrey 1985 29 p refs Presented at the 21st AIAA/ASME/SAE Joint Propulsion Conf., Monterey, Calif., 8 Jul. 1985
(Contract W-7405-eng-36)
(DE85-010771; LA-UR-85-1149; CONF-850712-4) Avail: NTIS HC A03/MF A01

The pulsed hydrojet is a device in which the water ingested from the free stream is accelerated out of the exhaust pipe to produce thrust. In this report a way of accelerating the stream of water with pockets of high pressure steam and gas generated inside the stream by an exothermal reaction of suitable propellant injected and dispersed in the water is described and analyzed. The velocity increment that must be imparted to the water to produce a substantial thrust need not be very large because the density of the water is comparable to the average density of the accelerated body. Results of the numerical modeling of the proposed jet acceleration mechanism indicate that the hydrojet propulsion device is potentially capable of propelling underwater projectiles at speeds three to five times greater than those currently attainable. Several promising applications of the hydrojet thruster are discussed and evaluated. Author

N85-33447# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
TURBULENCE MODELLING FOR THE PREDICTION OF TURBULENT JETS: WAKES AND PLUMES

M. R. Malin and D. B. Spalding Dec. 1984 89 p refs
(CFD/84/5) Avail: NTIS HC A05/MF A01

Numerical results of calculations for two-dimensional (including axisymmetric) external turbulent shear-flows (plane wall jets and plumes, plane surface jets, plane wakes, and free jets and plumes) are presented. The statistical approach adopted calculates the distribution of mean-flow quantities over the flow field by averaged transport equations. The unknown correlations representing the turbulent fluxes of heat and momentum are calculated with a transport model involving two local turbulence parameters; the turbulent kinetic energy and the time-mean square of the vorticity-fluctuations. The turbulence model is modified through algebraic-stress/flux modeling so as to account for the anisotropy of the turbulence field. Comparisons with experimental data are shown to be in reasonable agreement with measurements. Author (ESA)

N85-33448# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

THE CALCULATION OF TWO-DIMENSIONAL BUOYANT SURFACE JETS WITH THE k-W MODEL OF TURBULENCE

M. R. Malin Dec. 1984 57 p refs
(CFD/84/21) Avail: NTIS HC A04/MF A01

A buoyancy-extended version of the k-W model of turbulence which predicts two-dimensional turbulent buoyant surface jets with stable stratification is described. Differential transport equations are solved for the turbulent kinetic energy and the mean square of the vorticity fluctuations. The model uses a modified form of the vorticity-fluctuations equation, wherein the dissipation term is made a function of the local flux Richardson number. The algebraic-stress/flux-model approach is used to account for the reduction of the vertical turbulent transport of heat and momentum by stable stratification. The turbulence model is applied to the calculation of horizontal buoyant surface jets. Results agree with experimental data. Author (ESA)

N85-33449# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

COMPUTER AND WATER-MODEL SIMULATION OF FLOW THROUGH POPPET VALVES Ph.D. Thesis - London Univ.

H. Q. Qin Oct. 1984 280 p refs Sponsored by Chinese Ministry of Education and Peking Institute of Aeronautics and Astronautics
(CFD/85/2) Avail: NTIS HC A13/MF A01

A computer code embodying a two equation turbulence model simulated two-dimensional steady flows through axisymmetric pipe expansions, with and without partial obstruction by a poppet valve. Steady and unsteady laminar flows through the valves were considered. The effect of valve geometry on the discharge coefficient was investigated. Satisfactory agreement is obtained between the predicted values of the discharge coefficient and experimental data. A water-model rig of a valve port and cylinder was used to visualize the flow pattern near the plane of enlargement. The computer simulation of such flows is validated by photographs of vortices. The experiments reveal that the mixing process in the circumferential direction, especially within the cores of toroidal vortices, takes place with unexpected rapidity. This diffusion cannot be reliably accounted for with the information available. Author (ESA)

N85-33450# Institut Franco-Allemand de Recherches, St. Louis (France).

LASER DOPPLER ANEMOMETER (LDA) MEASUREMENTS IN THE TURBULENT NEAR-WAKE OF BLUNT BODIES

C. Berner and A. Koeneke 9 Jul. 1985 9 p refs Presented at 2nd Intern. Symp. on Appl. of Laser Anemometry to Fluid Mech., Lisbon, 2-4 Jul. 1984
(ISL-CO-212/84) Avail: NTIS HC A02/MF A01

Two dimensional laser Doppler anemometer measurements of the mean and turbulent velocity characteristics in the turbulent near-wake of blunt afterbodies at Mach numbers from 0.35 to 0.91 are summarized. There is reverse flow and a significant difference for the studied geometries. The rear stagnation point location is a function of Mach number. At constant Mach number the recirculating region decreases in size for increasing boattail angle and length. In the recirculating region maximum velocity on the near-wake centerline is equal to 35% of the free stream velocity regardless of Mach number. Turbulence quantities are higher for smaller mach numbers. Turbulent quantities are smaller when the recirculating region is reduced. Author (ESA)

N85-33451# Institut Franco-Allemand de Recherches, St. Louis (France).

MEASUREMENT OF VELOCITY AND CONCENTRATION IN FREE JETS [MESURES DE VITESSE ET DE CONCENTRATION DANS LES JETS LIBRES]

L. Bobin, J. Haertig, B. C. Jaeggy, and P. Meyer 12 Jul. 1984 42 p refs In FRENCH Presented at Direc. de Rech. et d'Etudes Tech. (DRET) Seance du Groupe de Travail sur Modelisation des Ecoulements Turbulents, en Fluides Compressibles, Paris, 22 Jun. 1984
(ISL-CO-215/84) Avail: NTIS HC A03/MF A01

Velocity measurement by laser Doppler anemometer and density measurement by spontaneous Raman emission are discussed. Application to excited free jets is examined. The coupling between average, coherent, and turbulent fields in an excited jet is discussed. The mixing and penetration of air in a CO2 jet are studied by Raman emission. The experimental set up is described. Author (ESA)

N85-33452# Institut Franco-Allemand de Recherches, St. Louis (France).

EXPERIMENTAL SIMULATION OF IN-BORE FLOWS USING A HIGH PRESSURE SHOCK TUBE

F. Seiler 24 Aug. 1984 11 p refs Presented at 8th Intern. Symp. on Ballistics, Orlando, Fla., 23-25 Oct. 1984
(Contract BMVG-T/R-760E-0007/E1707)
(ISL-CO-217/84) Avail: NTIS HC A02/MF A01

In-bore flows were simulated in a rectangular barrel attached to the end of a shock tube. Barrel flow was investigated using the method of characteristics. Approximation formulas for the boundary layer formation behind the moving projectile were found. Pistons with and without gas leakage were investigated by flow visualization. Flow in front of the projectiles with gas leakage is strongly affected. Boundary layer formation behind the pistons is less influenced by gas leakage. At the moment when the projectile passes the thin film gage a maximum heat flux is produced by hot gas coming into direct contact with the cold barrel surface. This effect can lead to a strong thermal stress in the barrel wall. Author (ESA)

N85-33453# Kentucky Univ., Lexington. Inst. for Mining and Minerals Research.

SOLIDS MIXING IN A THREE PHASE FLUIDIZED BED CONTAINING SPHERICALLY SHAPED-POROUS SOLID PARTICLES

George J. Snell and David Zopff May 1984 53 p refs Sponsored by Kentucky Energy Cabinet
(PB85-187961; IMMR84-098) Avail: NTIS HC A04/MF A01 CSCL 07A

Solids mixing a 3 phase fluidized bed containing 1.8 mm nominal diameter porous spherically shaped solids was studied using a batch type tracer technique. High speed photography was used to determine concentration time traces of color code solid tracer in a region near the wall of a 2 in. i.d. fluidization tube, located at a vertical elevation about 7 in. above the distributor. An add mixture of water and gaseous nitrogen at room temperature and essentially ambient pressure was used to fluidize a spherically shaped, nickel molybdate on alumina solid phase throughout this study. An empirical steady state mixing time was defined in order to characterize top to bottom of bed solids mixing. This mixing index was in turn correlated with superficial liquid velocity, superficial gas velocity, and an axial characteristic dimension.GRA

N85-33146# Joint Publications Research Service, Arlington, Va.

ONE METHOD OF SOLVING THE PROBLEM OF UNSTEADY HEAT EXCHANGE OF A BODY AND ITS ABLATION Abstract Only

A. F. Polyanskiy and L. I. Skurin *In its* USSR Rept.: Space

(JPRS-USP-84-006) 14 Nov. 1984 p 117 Transl. into ENGLISH from Vestn. Leningr. Univ.: Mat., Mekhan., Astronomiya (Leningrad), no. 2, Apr. 1984 p 62-66 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33205# California Univ., Davis.
PRESSURE CORRELATIONS IN TURBULENT REACTING FLOWS
W. Kollmann *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 10-11 refs (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

N85-33211# Sydney Univ. (Australia).
NONEQUILIBRIUM CHEMISTRY IN AN ISOTHERMAL TURBULENT FLOW
N. R. Mudford and R. W. Bilger *In* Sandia Labs. Sandia Coop. Group on the Aerothermochem. of Turbulent Combust. Dec. 1984 p 46-51 refs Original language document previously announced as A85-14371 Sponsored in part by Australian Research Grants Scheme (For primary document see N85-33203 22-25)
Avail: NTIS HC A04/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N85-33454# Department of Energy, Washington, D. C.
APPARATUS AND METHOD FOR IDENTIFICATION OF MATRIX MATERIALS IN WHICH TRANSURANIC ELEMENTS ARE EMBEDDED USING THERMAL NEUTRON CAPTURE GAMMA-RAY EMISSION Patent Application
D. A. Close (Los Alamos Scientific Lab.), L. A. Franks (Los Alamos Scientific Lab.), and S. M. Kocimski, inventor (to DOE) (Los Alamos Scientific Lab.) Filed 16 Aug. 1984 26 p
(Contract W-7405-eng-36)
(DE85-011659) Avail: NTIS HC A03/MF A01

An invention is described that enables the quantitative simultaneous identification of the matrix materials in which fertile and fissile nuclides are embedded to be made along with the quantitative assay of the fertile and fissile materials. The invention also enables corrections for any absorption of neutrons by the matrix materials and by the measurement apparatus by the measurement of the prompt and delayed neutron flux emerging from a sample after the sample is interrogated by simultaneously applied neutrons and gamma radiation. High energy electrons are directed at a first target to produce gamma radiation. A second target receives the resulting pulsed gamma radiation and produces neutrons from the interaction with the gamma radiation. These neutrons are slowed by a moderator surrounding the sample and bathe the sample uniformly, generating second gamma radiation in the interaction. The gamma radiation is then resolved and quantitatively detected, providing a spectroscopic signature of the constituent elements contained in the matrix and in the materials within the vicinity of the sample. DOE

N85-33455 National Physical Lab., Teddington (England). Div. of Materials Applications.
THE DESIGN, CONSTRUCTION AND OPERATION OF A LARGE-AREA, HIGH-TEMPERATURE, THERMAL CONDUCTANCE APPARATUS
W. P. Byrne and J. M. Cox Mar. 1985 56 p refs
(NPL-DMA(A)-84) Copyright. Avail: Issuing Activity

The conception and realization of an apparatus to measure the thermal properties of real, light-weight furnace insulation constructions are described. The apparatus is a box with a removable lid, the box being the furnace and the lid being the test wall assembly with a calorimeter which can be mounted on its outside surface. The whole box with its lid and calorimeter can be rotated on a horizontal axis so that the test wall can be used as furnace floor, wall, or roof. Insulation designs and installation techniques can be compared, together with effects due to fiber orientation, insulation density, and interfaces between insulating materials. External infrared thermography shows where improvements in construction and durability are needed, and when shrinkage problems occur. Measurement of devitrification and shrinkage effects indicate where insulating materials can be improved or where design limits must be adjusted. Author (ESA)

N85-33456*# Honeywell, Inc., Lexington, Mass. Aerospace and Defense Group.
MOSAIC INFRARED SENSOR FOR SPACE ASTRONOMY (MIRSSA) Interim Technical Report
Dec. 1983 39 p ref
(Contract NASw-3688)
(NASA-CR-176154; NAS 1.26:176154; H-8407-07) Avail: NTIS HC A03/MF A01 CSCL 14B

The development of mosaic infrared detector/focal plane arrays for space astronomy is reported. The Mosaic IR Sensor for Space Astronomy (MIRSSA) Program is an effort to develop PV HgCdTe detector arrays with the spectral response of up to 5 micron and silicon CCDs for low temperature applications. Desired background-limited performance (BLIP) for space applications requires an extremely high R sub A product which can be achieved by selecting the detector materials and the operating temperature. The parameters were determined by measurement of HgCdTe PV detector arrays at various temperatures in the SW and MW spectral bands. It is demonstrated that high performance PV HgCdTe detectors can be fabricated for low temperature applications.
E.A.K.

N85-33457# Army Armament Research and Development Command, Dover, N. J. Product Assurance Directorate.
AUTOMATIC SPHERICITY INTERFEROMETER FOR TESTING LENS RADII
J. Salerno Jun. 1985 24 p
(AD-A155736; AD-E401352; ARPAD-TR-85001) Avail: NTIS HC A02/MF A01 CSCL 20/6

The majority of lens radii measurements are made with test plates. This technique has the disadvantage of bringing the lens into direct contact with the test plate which can cause scratching of the surface and subsequent rejection of the test unit. In addition, test plate measurements are subjective because they depend on the experience and skill of the operator. As an alternative, an automated interferometric technique was evaluated for its ability to measure lens radii. This method uses a fizeau interferometer with the following accessories: transmission sphere, lens mount, and digital radius slide. This technique, chosen for its ease of operation and noncontact approach, proved to be a more suitable approach to radius measurement than the use of test plates, because it eliminated both the subjectivity and contact associated with the test plates. GRA

N85-33458# Department of the Air Force, Washington, D.C.
TRANSCEIVER TEST DEVICE Patent Application
DeBany, inventor (to Air Force) et al Filed 2 Oct. 1984 30 p
(AD-D011728; US-Patent-Appl-SN-657092) Avail: NTIS HC A03/MF A01 CSCL 14/2

A device for testing the digital waveforms in a special purpose multi-channel transceiver system designed to operate in a tactical environment. As selected waveforms are presented to the test device, they are randomized over a fixed time period creating a unique signature for comparison with a prestored signature at the end of the period. Uniquely assigned light emitting diodes identify which, if any, of the sequentially examined waveforms are incorrect. Provisions are included for latching the light emitting diodes in

their illuminated state in order to detect non-recurrent fault conditions. Author (GRA)

N85-33459# Department of Energy, Washington, D. C.
REMOTE TEMPERATURE-SET-POINT CONTROLLER Patent Application
W. F. Burke (Argonne National Lab., Ill.) and A. L. Winiecki, inventors (to DOE) (Argonne National Lab., Ill.) Filed 17 Oct. 1984 10 p
(Contract W-31-109-eng-38)
(DE85-011614; US-Patent-Appl-SN-661843) Avail: NTIS HC A02/MF A01 CSCL 14B

An instrument is described for carrying out mechanical strain tests on metallic samples with the addition of means for varying the temperature with strain. The instrument includes opposing arms and associated equipment for holding a sample and varying the mechanical strain on the sample through a plurality of cycles of increasing and decreasing strain within predetermined limits, circuitry for producing an output signal representative of the strain during the tests, apparatus including a set point and a coil about the sample for providing a controlled temperature in the sample, and circuitry interconnected between the strain output signal and set point for varying the temperature of the sample linearly with strain during the tests. DOE

N85-33460# Department of Energy, Washington, D. C.
CAPACITANCE MEASURING DEVICE Patent Application
W. H. Andrews, Jr., inventor (to DOE) (ORNL, Tenn.) Filed 1 Aug. 1984 13 p
(Contract DE-AC05-84OR-21400)
(DE85-011643; US-Patent-Appl-SN-636631) Avail: NTIS HC A02/MF A01 CSCL 14B

A capacitance measuring circuit is provided in which an unknown capacitance is measured by comparing the charge stored in the unknown capacitor with that stored in a known capacitance. Equal and opposite voltages are repetitively simultaneously switched onto the capacitors through an electronic switch driven by a pulse generator to charge the capacitors during the on portion of the cycle. The stored charge is compared by summing discharge currents flowing through matched resistors at the input of a current sensor during the off portion of the switching cycle. The net current measured is thus proportional to the difference in value of the two capacitances. The circuit is capable of providing much needed accuracy and stability to a great variety of capacitance based measurement devices at a relatively low cost. DOE

N85-33461# Department of Energy, Washington, D. C.
SHEAR WAVE TRANSDUCER FOR BOREHOLES Patent Application
N. H. Mao, inventor (to DOE) Filed 23 Aug. 1984 24 p
(Contract W-7405-eng-48)
(DE85-011662; US-Patent-Appl-SN-642348) Avail: NTIS HC A02/MF A01 CSCL 14C

A technique and apparatus is provided for estimating in situ stresses by measuring stress-induced velocity anisotropy around a borehole. Two sets each of radially and tangentially polarized transducers are placed inside the hole with displacement directions either parallel or perpendicular to the principal stress directions. With this configuration, relative travel times are measured by both a pulsed phase-locked loop technique and a cross correlation of digitized waveforms. The biaxial velocity data are used to back-calculate the applied stress. DOE

N85-33462# Department of Energy, Washington, D. C.
FIBER OPTIC MOISTURE SENSOR Patent Application
R. R. Kirkham, inventor (to DOE) (Pacific Northwest Lab., Richland, Wash.) Filed 3 Aug. 1984 10 p
(Contract DE-AC06-76RL-01830)
(DE85-011651; US-Patent-Appl-SN-637627) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus for sensing moisture changes by utilizing optical fiber technology is presented. One embodiment uses a reflective target at the end of an optical fiber. The reflectance of the target varies with its moisture content and can be detected by a remote unit at the opposite end of the fiber. A second embodiment utilizes changes in light loss along the fiber length. This is attributed to changes in reflectance of cladding material as a function of its moisture content. It can also be affected by holes or inserts interposed in the cladding material and/or fiber. Changing light levels can also be coupled from one fiber to another in an assembly of fibers as a function of varying moisture content in their overlapping lengths of cladding material. DOE

N85-33463# Department of Energy, Washington, D. C.
WIDE-RANGING RADIATION DOSE MONITOR Patent Application
M. K. Kopp, inventor (to DOE) Filed 20 Sep. 1984 12 p
(Contract DE-AC05-840R-21400)
(DE85-011596; US-Patent-Appl-SN-652395) Avail: NTIS HC A02/MF A01 CSCL 14B

A radiation dose-rate monitor is provided which operates in a conventional linear mode for radiation in the 0 to 0.5 R/h range and utilizes a nonlinear mode of operation for sensing radiation from 0.5 R/h to over 500 R/h. The nonlinear mode is achieved by a feedback circuit which adjusts the high voltage bias of the proportional counter, and hence its gas gain, in accordance with the amount of radiation being monitored. This allows compression of readout onto a single scale over the range of 0 to greater than 500 R/h without scale switching operations. DOE

N85-33464# Department of Energy, Washington, D. C.
ELECTROCHEMICAL METHANE SENSOR Patent Application
S. Zaromb, T. Otagawa, and J. R. Stetter, inventor (to DOE) Filed 27 Aug. 1984 26 p
(Contract W-31-109-eng-38)
(DE85-011663; US-Patent-Appl-SN-644467) Avail: NTIS HC A03/MF A01 CSCL 14B

A method and instrument including an electrochemical cell for the detection and measurement of methane in a gas is discussed. The method operates by the oxidation of methane electrochemically at a working electrode in a nonaqueous electrolyte at a voltage about 1.4 volts vs R.H.E. (the reversible hydrogen electrode potential in the same electrolyte), and the measurement of the electrical signal resulting from the electrochemical oxidation. DOE

N85-33465# Department of Energy, Washington, D. C.
ON-LINE TEMPERATURE SENSOR Patent Application
W. E. Cawley, inventor (to DOE) Filed 27 Jul. 1984 12 p
Sponsored by DOE
(DE85-011641; US-Patent-Appl-SN-635022) Avail: NTIS HC A02/MF A01

An on-line outlet temperature monitoring device is disclosed to back up readings provided by stationary temperature detectors on individual process tubes in a nuclear reactor. The monitoring device includes a highly accurate temperature sensor that can be selectively coupled to the outlet end of any chosen process tube to verify temperature readings pertaining to that process tube. Specifically, the sensor is suspended in a movable enclosure that can be shifted into position about a supporting wall for the protruding ends of the process tubes. The movable sensor is used to back up readings provided by the stationary temperature detectors and to recalibrate the stationary temperature detectors so as to permit their use at lower tolerance limits. DOE

N85-33466# Pacific Northwest Lab., Richland, Wash.
CURRENT INTERNAL-DOSIMETRY PRACTICES AT US DEPARTMENT OF ENERGY FACILITIES
R. J. Traub, B. L. Murphy, J. M. Selby, and B. J. Vallario Apr. 1985 72 p refs
(Contract DE-AC06-78RL-01830)
(DE85-011718; PNL-5437) Avail: NTIS HC A04/MF A01

The internal dosimetry practice at DOE facilities were characterized. The purpose was to determine the size of the facilities' internal dosimetry programs, the uniformity of the programs among the facilities, and the areas of greatest concern to health physicists in providing and reporting accurate estimates of internal radiation

dose and in meeting proposed changes in internal dosimetry. The differences among the internal-dosimetry programs are related to the radioelements in use at each facility and, to some extent, the number of workers at each facility. The differences include different frequencies in the use of quality control samples, different minimum detection levels, different methods of recording radionuclides, different amounts of data recorded in the permanent record, and apparent differences in modeling the metabolism of radionuclides within the body. Recommendations for improving internal-dosimetry practices include studying the relationship between air-monitoring/survey readings and bioassay data, establishing uniform methods for recording bioassay results, developing more sensitive direct-bioassay procedures, establishing a mechanism for sharing information on internal-dosimetry procedures among DOE facilities, and developing mathematical models and interactive computer codes that can help quantify the uptake of radioactive materials and predict their distribution in the body. DOE

N85-33467# Allied Bendix Corp., Kansas City, Mo.
EVALUATION OF COORDINATE MEASURING MACHINES Final Report
R. J. Russell May 1985 46 p refs
(Contract DE-AC04-76DP-00613)
(DE85-011712; BDX-613-3265) Avail: NTIS HC A03/MF A01

A method which evaluates large coordinate measuring machines (CMM) and estimates their measuring capabilities within a specified work volume was developed and implemented. Five CMMs were selected for evaluation. The methodology used to evaluate them, along with the test results, were discussed in a previous report. The data reduction method previously used was found to have several restrictions that limited its usefulness. A new method which has been implemented is discussed in this report. Three of the machines previously evaluated have work volumes far in excess of the standards previously used. A larger standard was designed, fabricated, and used to obtain the data required to complete the project goal. This device was used to estimate the precision and uncertainty of the three large CMMs. The results are reported. A technique which uses a small ball plate at several locations to estimate capability was tested on one of the three machines. The results were compared with those obtained with the large ball plate. The results were almost identical, but the recommended calibration method is to use a standard that covers the work zone of the CMM being evaluated. DOE

N85-33468# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).
IEA-SSPS CRS CALIBRATION REPORT: CALIBRATION OF RELEVANT MEASURING SENSORS
A. Brinner Jul. 1984 72 p refs
(Contract DE-AC04-76DR-00789)
(DE85-010174; DOE/ER-00789/T108; SSPS-TR-7/84) Avail: NTIS HC A04/MF A01

The results of tests on thermocouples and their cables are presented. Twelve thermocouples were recalibrated and 10 cables, including the transformation mV-output into current-signal, the transformation of the current-signal into binary code, and the conversion of the binary figure into real temperature were examined. The outputs of all thermocouples resulted in a deviation from the ideal value. Sodium flow meters were also calibrated and the results are included. DOE

N85-33469# Pacific Northwest Lab., Richland, Wash.
BETA RESPONSE OF SELECTED INSTRUMENTS
K. L. Swinth, L. A. Rathbun, C. D. Hooker, P. L. Roberson, and J. L. Kenoyer May 1985 11 p refs Presented at the Health Phys. Soc. Ann. Meeting, Chicago, 26 May 1985
(Contract DE-AC06-76RL-01830)
(DE85-013278; PNL-SA-12901; CONF-8505103-4) Avail: NTIS HC A02/MF A01

The beta measurement evaluation and upgrade program managed by Pacific Northwest Laboratory (PNL) for the Department of Energy's (DOE) Office of Nuclear Safety is focusing upon the identification and resolution of problems associated with the measurement of beta dose at DOE facilities. As part of this project, commonly used instruments and instruments under development are being evaluated with regard to their beta response and general performance characteristics. This paper describes test results for accuracy, beta energy response, angular response and general performance characteristics for selected instruments. DOE

N85-33470# Sandia Labs., Albuquerque, N. Mex.
OPTICAL-FIBER/MICROPROCESSOR-BASED REMOTE VELOCITY SENSOR
M. M. Robertson and J. P. Wolfe 1985 7 p refs Presented at the Spring Conf. on Exptl. Mech., Las Vegas, Nev., 9 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010071; SAND-85-0138C; CONF-850608-2) Avail: NTIS HC A07/MF A01

A remote velocity sensor has been developed that uses both a fiber optic system to monitor the position of an object and a microprocessor to track the object's position and calculate its average forward velocity between fiducial points (marks on a code plate). Sensing does not require electrical power at the sensing site, and the data are transmitted to the processing site by optical fibers whose inherent advantages include essential immunity to electromagnetic interference (EMI) and radio frequency interference (RFI). A feasibility model was designed, built, and evaluated that has a position resolution of 0.4 mm and is capable of calculating velocities up to 2.1 m/s with the particular code plate used. DOE

N85-33471# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
ERROR EVALUATION IN MEASUREMENTS WITH THERMOLUMINESCENT DOSIMETERS
R. Borio (Perugia University, Italy), G. CamposVenuti, and P. DegliEsposti (Perugia University, Italy) 5 Nov. 1984 42 p refs In ITALIAN; ENGLISH summary
(ISS-T-84/6; ISSN-0390-6485) Avail: NTIS HC A03/MF A01

Error sources connected with measurements with thermoluminescent dosimeters (LIF TLD-100) are analyzed. Sources such as feeding, environmental situations, and transport, do not have significant statistical influence. Readout calibration, annealing, and direction dependence can be minimized. Most of the random errors included in the data calibration fitting are relevant and cannot be eliminated. These include background variability, nonreproducibility of disks, and irradiation conditions. Author (ESA)

N85-33472# Institut Franco-Allemand de Recherches, St. Louis (France).
HOLOGRAPHIC CINEMATOGRAPHY WITH THE HELP OF A PULSE YAG LASER
P. Smigielski, H. Fagot, and F. Albe 12 Jul. 1984 9 p refs Presented at 13th Intern. Comm. for Optics ICO-13, Sapporo, Japan, 20-24 Aug. 1984 and 16th Intern. Congr. on High-Speed Photograph. and Photonics, Strasbourg, 27-31 Aug. 1984 and Intern. Adv. Study Inst., Optics Metrology, Viano do Castelo, Portugal, 16-24 Jul. 1984
(ISL-CO-213/84) Avail: NTIS HC A02/MF A01

Employing the rules of classical cinematography, holographic movies were produced on 35 mm films with the aid of a YAG laser which send pulses of 20 nsec with an energy of 30 mJ at a rate of repetition of 24 Hz. The experimental arrangements are given. The volume of the recording scene is > 1 cu m. The coherence length of the laser is > 1 m. Images of moving objects are given. Author (ESA)

N85-33473# Institut Franco-Allemand de Recherches, St. Louis (France).
CINEHOLOGRAPHY
P. Smigielski, H. Fagot, F. Albe, A. Stimpfling, R. Meyer, J. P. Schneider, and S. Reilhan 12 Jul. 1984 14 p refs In FRENCH; ENGLISH summary Presented at 4th Journees Professionnelles Opto-Electron. OPTO 84, Paris, 15-17 Mar. 1984 and 13th Intern. Comm. for Optics Congr. on Optics in Mod. Sci. and Technol.

ICO-13, Sapporo, Japan, 20-24 Aug. 1984 and 16th Intern. Congr. on High Speed Photograph. and Photonics, Strasbourg, 27-31 Aug. 1984 and Intern. Advance Study Inst. Optics Metrology Meeting, Viano do Castelo, Portugal, 16-27 Jul. 1984
(ISL-CO-214/84) Avail: NTIS HC A02/MF A01

Using the principles of classical cinematography, holographic movies were produced on 35 mm films with the help of a YAG laser which delivers pulses of 20 nsec with an energy of 30 mJ at a repetition rate of 24 Hz. The experimental arrangements are described. The volume of the recording scene is > 1 cu m. Coherence length of the laser is > 1 m. Images of moving objects are presented. Author (ESA)

N85-33474# Institut Franco-Allemand de Recherches, St. Louis (France).
NEW METHOD FOR COMPENSATING AND MEASURING ANY MOTION OF THREE-DIMENSIONAL OBJECTS IN HOLOGRAPHIC INTERFEROMETRY
A. Stimpfling and P. Smigielski 12 Jul. 1985 14 p refs In FRENCH; ENGLISH summary Presented at 4th Journees Professionelles Opto-Electron. OPTO 84, Paris, 15-17 Mar. 1984
(ISL-CO-216/84) Avail: NTIS HC A02/MF A01

A method to correct a general displacement (three translations and three rotations) is presented. Tests were done by real time and by double exposure holographic interferometry. The diffuse test object was subject to in-plane translations of 5 mm, out of plane translation of 1 mm, and rotations. With these amplitudes no interference fringes are visible but compensation is possible. Interference fringes progressively appear and finally the infinite fringe is obtained. The method used with a computer should allow the measurement of the different components of the motion even if its amplitude is greater than the dimensions of the object. Author (ESA)

N85-33475# Department of Agriculture, Washington, D.C.
ELECTRONIC TEMPERATURE EQUALIZER Patent Application
E. D. Bitner and E. B. Lancaster, inventors (to Dept. of Agriculture) Filed 29 Jan. 1985 13 p
(PB85-181485; US-Patent-Appl-SN-696274) Avail: NTIS HC A02/MF A01 CSCL 14B

An electronic circuit has been devised for precisely controlling the temperature of one zone in response to a change in temperature in another zone. Two sensors, one in each zone, are wired in opposing polarity so as to emit a signal when a temperature imbalance occurs. The circuit is designed to actuate a temperature controller in response to the signal. One application for the device is the establishment of adiabatic conditions for a reaction by controlling the temperature of the zone surrounding the reaction vessel to coincide with that within the vessel. GRA

N85-33476# Southwest Research Inst., San Antonio, Tex.
DEVELOPMENT OF A PROTOTYPE ENERGY METER Final Report, Nov. 1982 - Aug. 1984
J. E. Johnson, R. J. Magott, and C. M. Wood Aug. 1984 78 p Sponsored by Gas Research Inst.
(PB85-198430; GRI-84/0148) Avail: NTIS HC A05/MF A01 CSCL 10A

A pre-production prototype energy meter has been developed for determining the gross heating value of natural gas mixtures to an accuracy of 2%. The unit is small, does not rely on a combustion process, and can be produced at a cost that is substantially below existing energy metering systems. This development program has shown that dielectric constant measurements can be used to infer energy content; however, compensation techniques are needed to correct the dielectric readings for the effects of non-hydrocarbon diluent gases. A unique column separator has been developed for a compensation device. Meter control functions and computational needs are provided by a small scale microprocessor system. GRA

N85-33477# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
DURABILITY OF OXYGEN SENSORS
L. Snapp Mar. 1985 19 p
(PB85-183093; EPA/AA/SDSB/85-4) Avail: NTIS HC A02/MF A01 CSCL 13B

This report describes the results of dynamometer and vehicle durability testing from a variety of sources, as well as common causes of failure for oxygen sensors. The data indicates that oxygen sensors show low failure rates, even at mileages of 80,000 miles and beyond. GRA

N85-33315# Joint Publications Research Service, Arlington, Va.
SIGNAL PROCESSING IN QUASI-HOLOGRAPHIC SYSTEM AS AN INVERSE PROBLEM Abstract Only
B. S. Mush and L. S. Altman *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 1 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1242-1251 Original language document was announced in IAA as A84-43177 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33332# Joint Publications Research Service, Arlington, Va.
DEPTH DIMENSION COMPRESSION OF 3-D IMAGES Abstract Only
N. K. Ignatyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 12 Transl. into ENGLISH from Tekhn. Kino Televideniya (Moscow), no. 6, Jan. 1984 p 5-10 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33369# Joint Publications Research Service, Arlington, Va.
QUANTIZER OF IMAGES OF HEAT FIELDS OBTAINED BY RUBIN-TYPE INFRA-RED IMAGERS Abstract Only
O. K. Shabashev, A. A. Muraveyskaya, and S. V. Berezin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 53-53 Transl. into ENGLISH from Optiko-Mekhan. Prom. (Leningrad), no. 4, Apr. 1984 p 23-25 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33389# Joint Publications Research Service, Arlington, Va.
TRANSMITTER SPECTRUM ANALYZER Abstract Only
B. Stepanov and G. Shulgin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 10 Transl. into ENGLISH from Radio (Moscow), no. 9, Sep. 1983 p 17-21 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33413# Joint Publications Research Service, Arlington, Va.
ESTIMATING ANGULAR POSITION OF OPTICAL RADIATION SOURCE WHEN RECEIVED BY ARRAY OF PHOTODETECTORS Abstract Only
L. D. Vilesov and V. N. Veys *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 50 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 85-87 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33416# Joint Publications Research Service, Arlington, Va.
DIGITAL TACHOMETER Abstract Only
B. Shirokov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 52 Transl. into ENGLISH from Radio (Moscow), no. 11, Nov. 1983 p 28-29 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33417# Joint Publications Research Service, Arlington, Va.
GENERAL DESIGN PRINCIPLES OF HIGH SPEED FREQUENCY SYNTHESIZERS BASED ON PHASE SYNCHRONIZATION SYSTEMS Abstract Only
V. V. Shakhgildyan, A. V. Pestryakov, and A. I. Kabanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 52-53 Transl. into ENGLISH from Elektrosvyaz' (Moscow),

no. 10, Oct. 1983 p 36-42 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-33478# Department of Energy, Washington, D. C.
VACUUM ULTRAVIOLET LASER Patent Application
J. Berkowitz, B. M. Ruscic, and J. P. Greene, inventor (to DOE) Filed 6 Jul. 1984 15 p
(Contract W-31-109-eng-38)
(DE85-011632; Patent-Appl-SN-628700) Avail: NTIS HC A02/MF A01 CSCL 20E

Transitions from the 2p4(iso)35 2s1/2 state of atomic fluorine to all allowed loser states produces laser emission at six new wavelengths: 680.7A, 682.6A, 3592.7A, 3574.1A, 6089.2A, and 6046.8A. Coherent radiation at these new wavelengths can be generated in an atomic fluorine laser operated as an amplifier or as an oscillator. DOE

N85-33479# Department of Energy, Washington, D. C.
DEVICE FOR FREQUENCY MODULATION OF A LASER OUTPUT SPECTRUM Patent Application
J. R. Beene, inventor (to DOE) and C. E. Bemis, Jr., inventor (to DOE) Filed 17 Jul. 1984 12 p
(Contract DE-AC05-84OR-21400)
(DE85-011634; US-Patent-Appl-SN-631693) Avail: NTIS HC A02/MF A01 CSCL 20E

A device is provided for fast frequency modulating the output spectrum of multimode lasers and single frequency lasers that are not actively stabilized. A piezoelectric transducer attached to a laser cavity mirror is driven in an unconventional manner to excite resonance vibration of the transducer to rapidly, cyclicly change the laser cavity length. The result is a cyclic sweeping of the output wavelength sufficient to fill the gaps in the laser output frequency spectrum. When a laser is used to excite atoms or molecules, complete absorption line coverage is made possible. DOE

N85-33480# Stanford Linear Accelerator Center, Calif.
LASERTRON SIMULATION WITH A TWO-GAP OUTPUT CAVITY
W. B. Herrmannsfeldt Apr. 1985 11 p
(Contract AC03-76SF-00515)
(DE85-011213; SU-SLAC/AP-41) Avail: NTIS HC A02/MF A01

With a two gap output cavity, it is shown here that high RF efficiency, up to about 70%, is possible for the parameters planned for the SLAC lasertron experiment: 400 kV, 50 MW, 2856 MHz. A complete RF cycle is given in graphs. Graphs are given which also show field inputs, particle dynamics, RF phases, momentum control, collected energy, and double and multiple gaps. DOE

N85-33481# Los Alamos National Lab., N. Mex.
PICOSECOND-PULSE DAMAGE STUDIES OF DIFFRACTION GRATINGS
D. H. Gill and B. E. Newnam 1984 9 p refs Presented at the Symp. on Opt. Mater. for High Power Lasers, Boulder, Colo., 15 Oct. 1984
(Contract W-7405-eng-36)
(DE85-010785; LA-UR-85-1208; CONF-8410186-4) Avail: NTIS HC A02/MF A01

Diffraction gratings are frequently used in dye-laser cavities as wavelength-tuning elements. These gratings often limit the maximum laser output energy because of their low damage thresholds. The damage characteristics of both ruled and holographically produced gratings were measured under a variety of conditions. Using the single-shot-per-site mode, the samples were irradiated by 30-ps, 1.064-micron pulses with a spot size of 0.5-mm radius. It was found that holographic gratings have damage thresholds from 1.5 to 5.0 times higher than similar ruled gratings. Thresholds for S-polarized light were higher by factors of 1.5 to 6. For the same type grating, gold coatings yielded higher threshold than aluminum, although this is wavelength dependent. For holographic gratings, replicas have slight higher thresholds than masters. Dependence upon groove spacing is weak. Data are presented to show a variety of comparisons between different types of gratings, including two different manufacturers and usage at higher orders of incidence. DOE

N85-33482# Connecticut Univ., Storrs.
TRIVALENT CERIUM DOPED CRYSTALS AS TUNABLE LASER SYSTEMS: TWO BAD APPLES
D. S. Hamilton [1985] 13 p refs
(Contract DE-FG02-84ER-45056)
(DE85-008168; DOE/ER-45056/T2) Avail: NTIS HC A02/MF A01

The 5d-4f transitions of trivalent doped crystals have broad emission bands with large oscillator strengths and near unity quantum efficiency. These characteristics make cerium systems strong candidates for tunable solid state lasers. However, two such cerium crystals will probably never lase. The first is Ce(3+): YAG where a strong excited state absorption quenches the lasing transition. Recent measurements have indicated that the excited state absorption terminates in the YAG conduction band with a peak cross section of 1.0 x 10(-17) cm(2) at 700 nm. Some of the general features of impurity ion to band spectra are discussed. The second system is Ce(3+):CaF2 where a UV pump induced photochromic center is produced following excitation of the cerium ions. The initial measurements of cerium related transient absorptions in Ce(3+):YLF are also presented. DOE

N85-33483# Department of Energy, Washington, D. C.
ELECTRO-OPTIC HARMONIC CONVERSION TO SWITCH A LASER BEAM OUT OF A CAVITY Patent Application
R. A. Haas and M. A. Henesian, inventors (DOE) Filed 19 Oct. 1984 28 p refs
(Contract W-7405-eng-48)
(DE85-011619; US-Patent-Appl-SN-662642) Avail: NTIS HC A03/MF A01

The present invention relates to switching laser beams out of laser cavities, and more particularly, it relates to the use of generating harmonics of the laser beam to accomplish the switching. When laser light is generated in a laser cavity the problem arises of how to switch the laser light out of the cavity in order to make use of the resulting laser beam in a well-known multitude of ways. These uses include range finding, communication, remote sensing, medical surgery, laser fusion applications and many more. The switch out problem becomes more difficult as the size of the laser aperture grows such as in laser fusion applications. The final amplifier stages of the Nova and Novette lasers at Lawrence Livermore National Laboratory are 46 centimeters with the laser beam expanded to 74 centimeters thereafter. Larger aperture lasers are planned. DOE

N85-33484# California Univ., Livermore. Lawrence Livermore Lab.
EFFECTS OF LASER RADIATION ON SURFACES AND COATINGS
W. H. Lowdermilk 1 Mar. 1985 40 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract W-7405-eng-48)
(DE85-010475; UCRL-92262; CONF-850345-19) Avail: NTIS HC A03/MF A01

A summary is given of the principal aspects of laser induced damage to polished optical surfaces and dielectric, thin film, high reflectivity and antireflective coatings. Methods for producing porous antireflective surfaces and coatings and their damage properties are also reviewed. Finally, new areas of basic research to solve current and future problems are addressed. DOE

N85-33485# Politecnico di Torino (Italy). Dipt. di Ingegneria Aeronautica e Spaziale.
EXPANSION RATIO INFLUENCE ON POPULATION INVERSION

IN CO2/Ar CW GASDYNAMIC LASERS OPERATING AT VARIOUS TRANSITIONS WITHIN COUPLED UPSILON 1 AND UPSILON 2 MODES OF CO2

M. Brunne (Polish Acadamy of Sciences, Gdansk) and A. Cenian (Polish Academy of Sciences, Gdansk) Oct. 1983 48 p refs (STN-4) Avail: NTIS HC A03/MF A01

The relation between the stagnation temperature and the expansion end temperature and the population inversion formed by rapid expansion for various transitions among vibrational levels in coupled upsilon 1 and 2 modes of CO2 is discussed. The sample relations for a CO2/Ar mixture expanding in a logarithmic profile supersonic nozzle were derived. The results show that for different lines of the spectrum the relation between the ratio of expansion and the population inversion is different, thus allowing the possibility to tune CW gasdynamic laser output beam spectra by choosing the initial and/or final temperature of the expanded gas mixture. Author (ESA)

N85-33486# Institut Franco-Allemand de Recherches, St. Louis (France).

LASER EFFECTS ON OPAQUE TARGETS. PART 2C: THERMAL EFFECTS OF A TIME-VARIABLE BEAM INTENSITY Final Report [LASERWIRKUNG AUF UNDURCHSICHTIGE ZIELE. TEIL 2C: THERMISCHE WIRKUNGEN BEI ZEITVERAENDERLICHER INTENSITAET]

K. Daree 5 Mar. 1984 109 p refs In GERMAN (Contract BMVg-T/R-760/C-0009/C-1709) (ISL-R-105/84-Pt-2C) Avail: NTIS HC A06/MF A01

The temperature response to laser radiation varying in intensity over time was studied. Ablation of the fusion material due to laser beam induced pressure effects is considered. Thermal effects are studied in the case of plasma enhanced coupling and for vapor pressure effects capable of eliminating the melting matter. The absorption of laser radiation increases with temperature for bright metal surfaces. It is shown that temporal variation of intensity can be chosen so as to maintain high absorption throughout irradiation. Favorable intensity variations are characterized by high initial values (>100 kW/sq cm) and a rapid decrease in time. The fusion is accelerated with small beam diameters for thermally thick targets. Author (ESA)

N85-33487# Research Inst. of National Defence, Stockholm (Sweden).

HOLE CUTTING IN BUILDING FRAMES BY LASER

Mats Flaum Mar. 1985 30 p refs In SWEDISH; ENGLISH summary (Contract SWEDCBR-840860-3) (FOA-C-20569-D9; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Necessary laser performance for attaining useful kerf depths and cutting speeds in concrete is estimated with simple models and published data. The results indicate the model to be possible in principle, but probably requiring very high laser power outputs (several tenths of a kilowatt), and an intricate beam waveguide system. The equipment needed does not exist. In a laboratory test a 14 kW carbon dioxide laser, operating at 8 kW cut 38 mm thick concrete: cutting speed was 0,85 mm/sec for an average hole diameter of 6.4 mm. Author (ESA)

N85-33488# Institut Franco-Allemand de Recherches, St. Louis (France).

METAL VAPOR LASERS AND THEIR APPLICATIONS [LES LASERS A VAPEURS METALLIQUES ET LEURS APPLICATIONS]

A. Hirth 27 Aug. 1984 30 p refs In FRENCH Presented at Lasers and Microtech. Colloq., Besancon, France, 19-20 Sep. 1984 (ISL-CO-218/84) Avail: NTIS HC A03/MF A01

The characteristics, history, and applications of metal vapor lasers are reviewed. The metal halides variety is treated. Lasers in burst mode, self heated metal vapor, and mixed heating are discussed. Future trends are examined. Author (ESA)

N85-33379# Joint Publications Research Service, Arlington, Va.

SLIDING DISCHARGE IN CO2 AND EXCIMER LASERS Abstract Only

D. Yu. Zaroslov, G. P. Kuzmin, and V. F. Tarasenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 65 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1217-1241 Original language document was announced in IAA as A84-43176 (For primary document see N85-33314 22-33) Avail: NTIS HC A05/MF A01

N85-33426# Joint Publications Research Service, Arlington, Va.

PULSED LASERS FOR FILMING COLOR HOLOGRAPHIC FILM IMAGES Abstract Only

V. G. Komar and V. N. Sokolov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 61 Transl. into ENGLISH from Tekh. Kino i Televideniya (Moscow), no. 9, Sep. 1983 p 32-36 (For primary document see N85-33381 22-33) Avail: NTIS HC A05/MF A01

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-33489* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MULTISTAGE SPENT PARTICLE COLLECTOR AND A METHOD FOR MAKING SAME Patent

Ben T. Ebihara, inventor (to NASA) Issued 2 Jul. 1985 7 p Filed 30 Sep. 1983 Supersedes N84-12447 (22 - 03, p 0376) (NASA-Case-LEW-13914-1; US-Patent-4,527,092; US-Patent-Appl-SN-537615; US-Patent-Class-315-5.38; US-Patent-Class-315-3.5; US-Patent-Class-445-35) Avail: US Patent and Trademark Office CSCL 13I

A description is given of a spent particle collector which maintains structural integrity when raised to a high temperature although constructed of materials having widely different coefficients of expansion. The collector is comprised of one or more axisymmetric stages, each stage comprising a subassembly. A subassembly includes an inner pyrolytic graphite ring, a transition ring, a ceramic insulator ring and an outer metal ring which forms part of the wall of the collector. Each transition is of a ductile metal having high thermal conductivity and is provided with an annular sputter shield wall extending toward the source of spent particles and, where necessary, a trough in the other surface to enclose the sputter shield of the next adjacent transition ring. A plurality of radial extending slots are provided in a transition ring to form segments which are retained in their position by the sputter shield. Official Gazette of the U.S. Patent and Trademark Office

N85-33490* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DUAL CLEARANCE SQUEEZE FILM DAMPER Patent

David P. Fleming, inventor (to NASA) Issued 9 Jul. 1985 8 p Filed 5 Apr. 1984 Supersedes N84-22562 (22 - 13, p 1932) (NASA-Case-LEW-13506-1; US-Patent-4,527,910; US-Patent-Appl-SN-596960; US-Patent-Class-384-99; US-Patent-Class-384-101) Avail: US Patent and Trademark Office CSCL 13I

A dual clearance hydrodynamic liquid squeeze film damper for a gas turbine engine is described. Under normal operating conditions, the device functions as a conventional squeeze film damper, using only one of its oil films. When an unbalance reaches abusive levels, as may occur with a blade loss or foreign object damage, a second, larger clearance film becomes active, controlling vibration amplitudes in a near optimum manner until the engine can be safely shut down and repaired.

Official Gazette of the U.S. Patent and Trademark Office

N85-33491*# Transmission Research, Inc., Cleveland, Ohio.

ROLLING, SLIP AND TRACTION MEASUREMENTS ON LOW

MODULUS MATERIALS Interim Report
J. L. Tevaarwerk Jul. 1985 122 p refs
(Contract DEN3-35)
(NASA-CR-174909; NAS 1.26:174909; IR-3) Avail: NTIS HC A06/MF A01 CSCL 13I

Traction and wear tests were performed on six low modulus materials (LMM). Three different traction tests were performed to determine the suitability of the material for use as traction rollers. These were the rolling, slip and endurance traction tests. For each material the combination LMM on LMM and LMM on steel were evaluated. Rolling traction test were conducted to determine the load - velocity limits, the rolling traction coefficient of the materials and to establish the type of failures that would result when loading beyond the limit. It was found that in general a simple constant rolling traction coefficient was enough to describe the results of all the test. The slip traction tests revealed that the peak traction coefficients were considerably higher than for lubricated traction contacts. The endurance traction tests were performed to establish the durability of the LMM under conditions of prolonged traction. Wear measurements were performed during and after the test. Energetic wear rates were determined from the wear measurements conducted in the endurance traction tests. These values show that the roller wear is not severe when reasonable levels of traction are transmitted. Author

N85-33492# Department of Energy, Washington, D. C.
LATCH ASSEMBLY Patent Application
J. R. Frederickson, W. H. Harper, and R. Perez, inventors (to DOE) Filed 17 Aug. 1984 13 p Prepared in cooperation with Westinghouse Hanford Co.
(Contract DE-AC06-76FF-02170)
(DE85-011660; US-Patent-Appl-SN-641547) Avail: NTIS HC A02/MF A01

A latch assembly for releasably securing an article in the form of a canister within a container housing. The assembly includes a cam pivotally mounted on the housing wall and biased into the housing interior. The cam is urged into a disabled position by the canister as it enters the housing and a latch release plate maintains the cam disabled when the canister is properly seated in the housing. Upon displacement of the release plate, the cam snaps into latching engagement against the canister for securing the same within the housing. DOE

N85-33493# Department of the Air Force, Washington, D.C.
ROBOTIC ORDER PICKING Patent Application
H. A. Reuter, inventor (to Air Force) Filed 5 Apr. 1985 21 p
(AD-D011737; US-Patent-Appl-SN-720126) Avail: NTIS HC A02/MF A01 CSCL 09/2

A method fills a kit with required parts automatically. The parts are stored in an automatic storage and retrieval apparatus. The parts are held in a container stored in trays in the automatic storage and retrieval apparatus, On demand, a tray is placed at a transfer location whereat robot means removes the selected container, transports the selected container, opens the selected container over a kit box wherein the parts fall from the opened selected container, closes the selected container and returns it to the transfer location where the above apparatus replaces it in the storage area until another demand. The above continues until all parts are placed in the kit box. GRA

N85-33494# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR CASTING CONDUCTIVE AND SEMI-CONDUCTIVE MATERIALS Patent Application
T. F. Ciszek, inventor (to DOE) Filed 13 Aug. 1984 21 p
(Contract DE-AC02-83CH-10093)
(DE85-011655; US-Patent-Appl-SN-640286) Avail: NTIS HC A02/MF A01 CSCL 13H

A method and apparatus is disclosed for casting conductive and semi-conductive materials. The apparatus includes a plurality of conductive members arranged to define a container like area having a desired cross sectional shape. A portion or all of the conductive or semiconductive material which is to be cast is introduced into the container like area. A means is provided for inducing the flow an electrical current in each of the conductive members, which currents act collectively to induce a current flow in the material. The induced current flow through the conductive members is in a direction substantially opposite to the induced current flow in the material so that the material is repelled from the conductive members during the casting process. DOE

N85-33495# Department of Energy, Washington, D. C.
METHOD OF BONDING SILVER TO GLASS AND MIRRORS PRODUCED ACCORDING TO THIS METHOD Patent Application
J. R. Pitts, inventors (to DOE) (Midwest Research Inst., Golden, Colo.), T. M. Thomas (Midwest Research Inst., Golden, Colo.), and A. W. Czanderna (Midwest Research Inst., Golden, Colo.) Filed 31 Jul. 1984 28 p
(Contract DE-AC02-83CH-10093)
(DE85-011642; US-Patent-Appl-SN-636511) Avail: NTIS HC A03/MF A01 CSCL 13H

A method for adhering silver to a glass substrate for producing mirrors includes attaining a silicon enriched substrate surface by reducing the oxygen therein in a vacuum and then vacuum depositing a silver layer onto the silicon enriched surface. The silicon enrichment can be attained by electron beam bombardment, ion beam bombardment, or neutral beam bombardment. It can also be attained by depositing a metal, such as aluminum, on the substrate surface, allowing the metal to oxidize by pulling oxygen fro the substrate surface, thereby leaving a silicon enriched surface, and then etching or eroding the metal oxide layer away to expose the silicon enriched surface. Ultraviolet rays can be used to maintain dangling silicon bonds on the enriched surface until covalent bonding with the silver can occur. This disclosure also includes encapsulated mirrors with diffusion layers built therein. One of these mirrors is assembled on a polymer substrate. DOE

N85-33496# Department of Energy, Washington, D. C.
PORTABLE CUTTING APPARATUS Patent Application
R. F. Gilmore, inventor (to DOE) Filed 17 Jul. 1984 19 p
(Contract DE-AC06-76FF-02170)
(DE85-011635; US-Patent-Appl-SN-631697) Avail: NTIS HC A02/MF A01 CSCL 13I

A remotely operable, portable cutting apparatus detachably secured to the workpiece by laterally spaced clamp assemblies engagable with the workpiece on opposite sides of the intended line of cut. A reciprocal cutter head is mounted between the clamp assemblies and is provided with a traveling abrasive cutting wire adapted to sever the workpiece normal to the longitudinal axis thereof. Dust and debris are withdrawn from the cutting area by a vacuum force through a nozzle mounted on the cutting head. DOE

N85-33497# Department of Energy, Washington, D. C.
MECHANICAL CONNECTION FOR A TUBULAR ASSEMBLY Patent Application
J. M. Grover, inventor (to DOE) (Westinghouse Electric Corp., Pittsburgh) Filed 12 Sep. 1984 19 p
(Contract DE-AC06-76FF-02170)
(DE85-011590; US-Patent-Appl-SN-649772) Avail: NTIS HC A02/MF A01

A mechanical connection assembly for connecting two telescopically related parts together in a fluidtight relation is described. The system uses snap in fasteners having flexible barbed tangs which are snapped into receiving holes formed in the parts being attached together. A locking pin can be inserted into a central aperture through the snap in fastener to secure the fastener in the receiving holes. The system also includes a seal having sealing surfaces at least one of which is formed at an angle inclined relative to a true vertical. A metallic sealing element is interposed between the sealing surfaces. The geometry of the sealing surfaces is capable of compensating for the differential thermal growth rates occurring when the two parts are made from dissimilar metals. DOE

N85-33498# Sandia Labs., Livermore, Calif.
PROPERTIES OF Ti-6Al-4V SPUN FORMED FUZE SUPPORTS

N. R. Moody and G. Gates (Allied Bendix Corp., Kansas City, Mo.) May 1985 40 p refs
(Contract DE-AC04-76DR-00789)
(DE85-011968; SAND-85-8218) Avail: NTIS HC A03/MF A01

Spin forming is designated as the primary fabrication process for the Ti-6Al-4V, W-87 fuze support. This process reduces the amount of rough machining during production, the cost of the starting material and the lead time from order to delivery of finished parts compared with parts made from forgings. However, because the amount of deformation from the spin forming process varies greatly within the part, the properties resulting from spin forming the fuze supports are unknown. This study shows that the properties and microstructure of the highly deformed walls of the fuze support are similar to those of forgings, while the properties and microstructure of the lightly deformed nose are similar to those of the parent plate. A solution treatment at 1750(0)F/1h/WQ (954(0)C) followed by a 900(0)F (482(0)C) four hour age gives the desired properties. Additionally, microstructural evaluation shows that the temperatures during spin forming are maintained within desired limits and that no significant microstructural changes occur during subsequent elevated temperature processing of the finished part. This study shows that solution treated and aged parts meet all required properties for all conditions to which the fuze supports will be subjected. DOE

N85-33499# Winsmith, Springville, N.Y.
DEPARTMENT OF ENERGY GEAR DRIVE UNIT FINAL PROTOTYPE TESTING AND DESIGN EVALUATION
R. S. Bhise, R. H. Metzger, and R. S. Zajac Oct. 1984 191 p
(Contract DE-FC04-80CS-30602)
(DE85-003296; DOE/CS-30602/T1; Rept-47) Avail: NTIS HC A09/MF A01 CSCL 13I

UniDynamics (formerly UMC Industries), Winsmith Division and the US Department of Energy entered a cooperative agreement in September of 1980 to design and develop a mass producible gear drive (DOE gear drive unit), for line focus tracking concentrating solar collectors under the technical direction of Sandia Laboratories, Albuquerque, New Mexico. The gear drive was developed in two phases. The Phase 1 gear drive unit was primarily fabricated and tested for concept evaluation, while the Phase 2 gear drive design effort, on the other hand, was developed for mass producibility and refinement. A combination of design and material selection resulted in acceptable overall performance with an efficiency of 34 percent at an operating output torque of 18,000 in-lbs. This was accomplished with a two stage gear drive consisting of nitrided steel primary gearing and a second stage wormgear drive with a tin-plated nodular iron wormgear. A maximum operating survival load of 57,000 in-lbs. was applied without failure, and 720 hour continuous life test at 6000 in-lbs. of torque resulted in no problems. A new design will be required to provide overload protection since the shear pin concept failed. DOE

N85-33500# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
FUTURE OF ROBOTS IN NUCLEAR PLANTS AND PROCESSES
J. J. Fisher and J. S. Byrd 1985 21 p Presented at Executive Conf. on Remote Operations and Robotics in the Nucl. Ind., Pine Mountain, Ga., 21 Apr. 1985
(Contract DE-AC09-76SR-00001)
(DE85-011505; DP-MS-85-38; CONF-850425-3) Avail: NTIS HC A02/MF A01

The role of robotics at the Savannah River Plant and Laboratory is reviewed. The site's remote process areas are described and existing remote handling equipment and robots are discussed. Three technology areas under development and relating to process automation are reviewed. These areas are: (1) inspection systems to detect and evaluate process problems or to determine equipment integrity; (2) process monitoring systems to analyze plant operations and to supply information in the event of an unusual occurrence; and (3) remote manipulator systems and controls to handle instruments and tools. A technique is presented for employing future intelligent robots through process networks. These networks will represent the integration of robotic technology with dedicated process knowledge bases. DOE

N85-33501# California Univ., Livermore. Lawrence Livermore Lab.
GENERATION OF ROUND BORES IN COMPOSITE STRUCTURE RAILGUNS
A. R. Susoeff, R. S. Hawke, and G. H. Newman 7 Mar. 1985 14 p
(Contract W-7405-eng-48)
(DE85-011872; UCID-20408) Avail: NTIS HC A02/MF A01

A technique was developed to generate precision round hole bores in composite structure railguns. Development of tooling geometry, tool drive mechanism and coolant feed system was successfully carried out. The combined techniques provide bores that are round and have better than 1.6 micrometers surface finish throughout the 6 meter length and less than 25 microns diameter runout. Draw reaming with a pilot bushing is the method of machining. The bore is characterized first by comparison with a surface roughness gauge using a rigid bore scope and then by diameter measurement using air plugs/electronic gauging with subsequent digitized data collected on floppy discs. Nonferrous metals and plastic dielectric, including polycarbonate and fiberglass reinforced polyester were cut. The resulting railguns are successfully used for experiments conducted in a vacuum chamber pumped to less than 3 x 10 to the 6 torr pressure. DOE

N85-33502# Michigan Univ., Ann Arbor.
MULTIPARAMETER CONDITIONALLY SAMPLED LASER VELOCIMETRY MEASUREMENTS DURING FLAME PROPAGATION IN A SPARK IGNITION ENGINE
J. K. Martin, P. O. Witze (Sandia Labs., Livermore, Calif.), and C. Borgnakke Jun. 1984 13 p Presented at 20th Intern. Symp. on Combust., Ann Arbor, Mich., 12 Aug. 1984
(Contract DE-AC04-76DR-00789)
(DE85-009850; SAND-84-8224; CONF-840801-16) Avail: NTIS HC A02/MF A01

Laser Doppler velocimeter results are presented for the mean velocity and turbulence intensity measured during combustion in a research engine. The cylinder pressure and time of flame arrival at the LDV measurement volume were also recorded for subsequent application of conditional sampling techniques in the data-averaging procedure. For velocity measurements made at different locations along the path of flame propagation, it is shown how the pressure history for each individual engine cycle can be used to relate the fluid mechanics from point to point. Additional conditional sampling, using the flame arrival time, is applied to further identify a set of similar combustion events with reduced bias from cyclic variations in the combustion rate. The fluid mechanics in the engine are very complex with strong mean motions and anisotropic nonhomogeneous turbulence. Combustion appears to amplify the turbulence in the preflame gas although the measured changes may be due, in part, to flame-induced convection of nonhomogeneous turbulence. DOE

N85-33503# Oak Ridge National Lab., Tenn.
MACHINE INTELLIGENCE FOR ROBOTICS APPLICATIONS
C. R. Weisbin, J. Barhen, G. deSaussure, W. R. Hamel, C. Jorgensen, E. M. Oblow, and R. E. Ricks 1985 12 p Presented at the Intelligent Systems and Machines Conf., Rochester, Mich., 22 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-011430; CONF-8504117-2) Avail: NTIS HC A02/MF A01

As a result of initial experimentation with HERMIES-I mobile robot, hardware and software upgrades were implemented which enable fully synchronous sonar operation, improved stepper motor control for the sensory platform, and more reliable wheel drive control. The current system, designated as HERMIES-II, is discussed. Successful demonstration of dead reckoning navigation and the development of a sensor based exploration and discovery algorithm which can now handle typical maze problems are reported. The development of HERMIES brain as a hypercube ensemble machine with concurrent computation and associated

message passing is described. Algorithms for mapping precedence constrained task graphs onto a hypercube yield results with high efficiency and proper load balance. A framework for a hybrid uncertainty analysis theory for decision making is described. DOE

N85-33504# Department of Energy, Washington, D. C.
NON-BONDED ULTRASONIC TRANSDUCER Patent Application
J. M. Eoff, inventor (to DOE) (Rockwell International Corp., Golden, Colo.) Filed 6 Jul. 1984 14 p refs
(Contract DE-AC04-76DP-03533)
(DE85-011006; US-Patent-Appl-SN-628078) Avail: NTIS HC A02/MF A01

A mechanically assembled nonbonded ultrasonic transducer is described which includes a substrate, a piezoelectric film, a wetting agent, a thin metal electrode, and a lens held in intimate contact by a mechanical clamp. No epoxy or glue is used in the assembly of this device. DOE

N85-33505# Goodyear Atomic Corp., Piketon, Ohio.
AUTOMATIC ROTARY VALVE ACTUATOR
W. E. Cook 28 Mar. 1985 51 p refs
(Contract DE-AC05-76OR-00001)
(DE85-012797; GAT-T-3334) Avail: NTIS HC A04/MF A01

The design, construction, and operation of a microcomputer controlled valve actuator for operating test valves requiring rotary motion of the valve stem is described. An AIM 65 microcomputer, using a FORTH language program, controls an air motor and air clutch mounted within an oven to accomplish testing at elevated temperatures. The valve actuator closes the test valve until a present torque is reached and then opens the valve to its initial starting point. The number of cycles and extremes of rotation are tallied and printed as the test progresses. Provisions are made to accept remote signals to stop the test and to indicate to a remote device when the test has been stopped. DOE

N85-33506# Sheffield Univ. (England). Dept. of Control Engineering.
HAROLD HAZEN AND THE THEORY AND DESIGN OF SERVOMECHANISM
Stuart Bennett Nov. 1984 44 p refs
(RR-270) Avail: NTIS HC A03/MF A01

Hazen's work in the 1930's on the network analyzer, servomechanisms, the Product Integraph, and the Cinema Integraph is outlined. His influence on control engineering is assessed.
Author (ESA)

N85-33507# Technical Research Centre of Finland, Espoo. Metals Lab.
REACTOR PRESSURE VESSEL STEELS ASME SA533B AND SA508 C 1.2
Reijo Pelli and Kari Toerroenden Feb. 1985 27 p refs Sponsored by Finnish Ministry of Trade and Industry and Technical Research Centre of Finland
(VTT-340; ISBN-951-38-2251-6; ISSN-0358-5077) Avail: NTIS HC A03/MF A01

Information needed to assess the structural integrity of reactor pressure vessels made of the steels SA533B and SA508 C 1-2 was collected. Microstructural characteristics and basic mechanical properties as a function of varying heat treatments were evaluated. Technical data for pressure vessel manufacturing, especially heat treating, were generated. Recommendations for austenitizing and tempering treatments were made. The microstructure after a wide variety of heat treatments proves to be granular bainite.
Author (ESA)

N85-33508# Stuttgart Univ. (West Germany). Inst. fuer Kernenergetik und Energiesysteme.
WELDING METHODS FOR HIGH MELTING METALS [SONDERFUEGEVERFAHREN FUER HOCHSCHMELZENDE METALLE]
Hans-G. Mayer 1984 8 p In GERMAN
Avail: NTIS HC A02/MF A01

Electron beam and diffusion welding of high melting metals are treated. Both methods can be applied in vacuum. The methods can establish material transitions forbidden according to metallographic laws. Author (ESA)

N85-33129# Joint Publications Research Service, Arlington, Va.
SPECIAL TOOLS USED BY COSMONAUTS IN EVA Abstract Only
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 7 Transl. into ENGLISH from Pravda (Moscow), 9 Aug. 1984 p 6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33145# Joint Publications Research Service, Arlington, Va.
PROSPECTIVE USES FOR DIFFUSION WELDING IN VACUUM Abstract Only
Nikolay Fedotovich Kazakov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 116 Transl. into ENGLISH from Krasnaya Zvezda (Moscow), 4 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33524*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCES IN SPUTTERED AND ION PLATED SOLID FILM LUBRICATION
T. Spalvins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 209-224 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33525*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
TELEPRESENCE WORK SYSTEM CONCEPTS
Lyle M. Jenkins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 225-233 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33526*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DUAL ARM MASTER CONTROLLER DEVELOPMENT
D. P. Kuban (ORNL, Tenn.) and G. S. Perkins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 235-250 refs (For primary document see N85-33512 22-39)
(Contract DE-AC05-84OR-21400)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33527*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MAN-VEHICLE SYSTEMS RESEARCH FACILITY ADVANCED AIRCRAFT FLIGHT SIMULATOR THROTTLE MECHANISM
Seth S. Kurasaki and Wilbur C. Vallotton *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 251-257 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33528*# Tokyo Univ. (Japan). Inst. of Space and Astronautical Science.
THE DEVELOPMENT OF STAGING MECHANISMS FOR THE JAPANESE SATELLITE LAUNCHER Mu-3SII
Junjiro Onoda *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 259-276 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33529*# Sperry Corp., Phoenix, Ariz. Space Systems Div.
A ROTATING ELECTRICAL TRANSFER DEVICE
Ryan S. Porter *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 277-291 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33530*# Martin Marietta Aerospace, Denver, Colo.
A DUAL, FAULT-TOLERANT AEROSPACE ACTUATOR
Clete J. Siebert *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 293-303 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33531*# Sunstrand Energy Systems, Rockford, Ill.
DESIGN OF A DUAL FAULT TOLERANT SPACE SHUTTLE PAYLOAD DEPLOYMENT ACTUATOR
Duane R. Teske *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 305-313 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33532*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
FEATURES OF THE SOLAR ARRAY DRIVE MECHANISM FOR THE SPACE TELESCOPE
Raimund G. Hostenkamp *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 315-327 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33533*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
APPENDAGE DEPLOYMENT MECHANISM FOR THE HUBBLE SPACE TELESCOPE PROGRAM
Herbert T. Greenfield *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 329-346 ref Sponsored by NASA. Marshall Space Flight Center (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33534*# Hughes Aircraft Co., El Segundo, Calif.
SIX MECHANISMS USED ON THE SSM/1 RADIOMETER
Howard R. Ludwig *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 347-362 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33535*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CIRCULATION CONTROL LIFT GENERATION EXPERIMENT: HARDWARE DEVELOPMENT
Tina L. Panontin *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 363-378 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

N85-33536*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWO-PLANE BALANCE AND SLIP-RING DESIGN
Phil M. Luna *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 379-387 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-33509# NDT Technologies, Inc., South Windsor, Conn.
ELECTROMAGNETIC INSPECTION OF WIRE ROPES USING SENSOR ARRAYS Quarterly Progress Report, 16 Dec. 1984 - 15 Mar. 1985
H. R. Weischedel 15 May 1985 21 p
(Contract N00014-83-C-0484)
(AD-A155412) Avail: NTIS HC A02/MF A01 CSCL 14/2

Prototype instrumentation and procedure for the inspection of wire rope end sections were improved. Laboratory experiments clearly demonstrate the viability of this approach; however, a considerable amount of field testing and further development will be required to make this procedure sufficiently rugged and reliable under adverse field conditions. The following is a summary of the additional development work necessary to make end section inspections a useful in-service inspection procedure: develop bigger instruments to accommodate prevalent rope and socket sizes; reconfigure signal acquisition and processing system to make it portable and sufficiently rugged for field use; redesign and extend signal conditioning software to make it usable for relatively unskilled personnel; redesign optical position transducer to increase its resolving power; and perform extensive field testing to eliminate unexpected problems and to establish credibility of the new procedure and to make end section inspection an accepted and viable in-service inspection method. A new mechanical rope position transducer was developed and manufactured. As compared to our previous designs, the new transducer is drastically simplified and ruggedized. GRA

N85-33510# Societe Nationale Industrielle Aerospatiale, Suresnes (France). Lab. Central.
STUDY OF AN ULTRASONIC DETECTION METHOD TO INSPECT BONDING EFFECTS IN LIGHT ALLOY BONDED STRUCTURES, TEST REPORT NO. 43-954/F [ETUDE D'UNE METHODE DE DETECTION PAR ULTRASONS DES DEFAUTS DE COLLAGE DANS DES STRUCTURES EN ALLIAGES LEGERS COLLEES, PROCES VERBAL 43-954/F]
D. Lecuru 2 Aug. 1984 95 p In FRENCH
(Contract STPA-82-96-006)
(PV-43-954/F) Avail: NTIS HC A05/MF A01

Nondestructive methods to replace the Fokker bond test were studied considering also the possibility of automation of the control. An ultrasonic method without intermediate liquid coupling was chosen. The experimental tests over a large number of samples show that the method fulfills the requirements.
Author (ESA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N85-33511 Defence Research Information Centre, Orpington (England).
NUMERICAL EXPERIMENT OF ELASTIC WAVE PROPAGATION BY FRAMEWORK MODEL
Y. Sato and M. Nitabaru Mar. 1985 30 p refs Transl. into ENGLISH from Repts. of Faculty of Kagoshima Univ. (Japan) no. 13, 1980 p 105-120
(DRIC-T-7462; BR95441) Copyright. Avail: NTIS HC A03/MF A01

Elastic wave propagation in a medium with a complicated boundary surface was investigated numerically using a framework mass point system. This type of model avoids the difficulty of satisfying boundary conditions which can scarcely be solved by an analytical method or by numerical calculations based on the finite difference method. Waveforms at free surfaces are calculated for half space, quarter space, half space with step discontinuity, and half space with surface crack. These data are used to investigate travel times of different wave phases, reflection and transmission coefficients, and energy loss of surface waves at incidence to a corner, step, or crack. Results suggest that the framework model is useful for this kind of investigation.
Author (ESA)

N85-33512*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NINETEENTH AEROSPACE MECHANISMS SYMPOSIUM
Aug. 1985 389 p refs Symp. held at Moffett Field, Calif., 1-3 May 1985; sponsored by NASA, Washington, D.C., California Inst. of Tech., Pasadena, and LMSC, Sunnyvale, Calif.

(NASA-CP-2371; Rept-85181; NAS 1.55:2371) Avail: NTIS HC A17/MF A01 CSCL 20K

The proceedings of the 19th Aerospace Mechanisms Symposium are reported. Technological areas covered include space lubrication, bearings, aerodynamic devices, spacecraft/Shuttle latches, deployment, positioning, and pointing. Devices for spacecraft docking and manipulator and teleoperator mechanisms are also described. For individual titles, see N85-33513 through N85-33536.

N85-33513*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE GALILEO SPACECRAFT MAGNETOMETER BOOM

Douglas T. Packard and Max D. Benton (ACE-Able Engineering, Goleta, Calif.) *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 1-22 refs (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

The Galileo spacecraft utilizes a deployable lattice boom to position three science instruments at remote distances from the spacecraft body. An improved structure and mechanism to precisely control deployment of the boom, and the unique deployment of an outer protective cover are described. Author

N85-33514*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HOOP/COLUMN ANTENNA DEPLOYMENT MECHANISM OVERVIEW

B. B. Allen (Harris Corp., Melbourne, Fla.) and D. H. Butler *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 23-37 (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

The hoop/column antenna program is directed toward the development of a cost effective, large area, self deploying reflector antenna system. Large surface area antenna systems are required in future space missions involving improved land communications, Earth resources observation, and the study of intergalactic energy sources. The hoop/column antenna is a concept where a large antenna system can be packaged within the Space Transportation System (Shuttle) payload bay, launched into Earth orbit where it is released either for deployment as an Earth observation or communications antenna, or boosted into deep space as an intergalactic energy probe. Various mechanisms and support structures are described that are required to deploy the hoop, which is used to support the antenna reflective surface, and the column that is used to position the antenna feeds and the reflector. It also describes a proof-of-concept model (15 meters in diameter) that is currently being ground tested to determine the adequacy of the deployment mechanisms. Author

N85-33515*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DEVELOPMENT OF AN ENERGY-ABSORBING PASSENGER SEAT FOR A TRANSPORT AIRCRAFT

Charles P. Eichelberger, Emilio Alfaro-Bou, and Edwin L. Fasanella (Kentron International, Hampton, Va.) *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 39-58 refs (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

Commercial air transport passenger safety and survivability, in the event of an impact-survivable crash, are subjects receiving increased technical focus/study by the aviation community. A B-720 aircraft, highly instrumented, and remotely controlled from the ground by a pilot in a simulated cockpit, was crashed on a specially prepared gravel covered impact site. The aircraft was impacted under controlled conditions in an air-to-ground gear-up mode, at a nominal speed of 150 knots and 4-1/2 deg glide slope. Data from a number of on board, crash worthiness experiments provided valuable information related to structural loads/failure modes, antimisting kerosene fuel, passenger and attendant restraint systems and energy absorbing seats. The development of an energy absorbing (EA) seat accomplished through innovative modification of a typical modern standard commercial aviation transport, three passenger seat is described. Author

N85-33516*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

A MODULAR DOCKING MECHANISM FOR IN-ORBIT ASSEMBLY AND SPACECRAFT SERVICING

F. Gampe, K. Priesett, and R. H. Bentall (ESA. ESTEC, Noordwijk, Netherlands) *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 59-74 (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

A Docking Mechanism concept is described which is suitable for use with autonomous docking systems. The central feature of using simple cylindrical handles on one side and a type of prism seating on the other is offered as a practical method of achieving a standardized structural interface without freezing continued development of the latches, either technically or commercially. The main emphasis in docking mechanism concepts is in two directions: (1) a very simple docking mechanism, involving mainly the latch mechanism to achieve a structural link; and (2) a sophisticated Docking Mechanism, where the latch mechanism is designed for nonrigid spacecraft and the achievement of very low dynamic interactions between spacecraft during the docking process. Author

N85-33517*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

DRAG-COMPENSATED, PRECISION-POWERED HINGE SYSTEM

G. G. Jacquemin and S. J. Rusk *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 75-86 (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

The design of a high precision powered hinge is complicated by the unavoidable presence of parasitic drag torque resulting mainly from friction and transfer of power, signals, and fluids across the hinge. Regardless of the type of drive system selected, it is impossible to completely eliminate all parasitic drag. However, the mechanism described here comes very close to providing a drag free system. All sources of parasitic drag torque are collected on a shaft which is powered by an electric motor independent of the main hinge drive. Under control of a sensor, the electric motor applies a compensating torque equal to that of the parasitic drag torque, allowing the main hinge drive to operate in a practically drag free environment with very high positioning precision. Author

N85-33518*# Spar Aerospace Ltd., Ste-Anne-de-Bellevue (Quebec).

DESIGN AND DEVELOPMENT OF A LINEAR THERMAL ACTUATOR

Gerry Bush and Don Osborne *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 87-102 Sponsored by Canadian Dept. of Communications (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

The design and development of a linear thermal actuator (LTA) for space applications is described. The actuator is driven by thermal energy and utilizes the property of thermal expansion to do work. Equations to predict performance are developed and used to optimize the design of the development model LTA. Design details and test results are presented and discussed. Author

N85-33519*# Spar Aerospace Ltd., Toronto (Ontario).

THE DESIGN AND DEVELOPMENT OF A CONSTANT-SPEED SOLAR ARRAY DRIVE

Howard M. Jones and Neil Roger *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 103-118 Sponsored by Canadian Dept. of Communications and International Telecommunications Satellite Organization (For primary document see N85-33512 22-39)

Avail: NTIS HC A17/MF A01 CSCL 20K

The design and development of a constant-speed solar array

drive system for use in high power communications satellites is described. The relationship between continuity of motion in the solar array drive and spacecraft attitude disturbance is investigated. The selection of the system design based on the design requirements including spacecraft disturbance is discussed. The system comprises two main parts: the drive mechanism including small angle stepper motor and reduction gearing and the control electronics including ministepping drive circuits, such that a very small output step size is achieved. Factors contributing to discontinuities in motion are identified and discussed. Test methods for measurement of very small amplitudes of discontinuity at low rotational rates are described to assist in the testing of similar mechanisms. Author

N85-33520*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF TRACTION DRIVES AS SERVO MECHANISMS
Stuart H. Loewenthal, Douglas A. Rohn, and Bruce M. Steinetz *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 119-139 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 20K

The suitability of traction drives for a wide class of aerospace control mechanisms is examined. Potential applications include antenna or solar array drive positioners, robotic joints, control moment gyro (CMG) actuators and propeller pitch change mechanisms. In these and similar applications the zero backlash, high torsional stiffness, low hysteresis and torque ripple characteristics of traction drives are of particular interest, as is the ability to run without liquid lubrication in certain cases. Wear and fatigue considerations for wet and dry operation are examined along with the tribological performance of several promising self lubricating polymers for traction contracts. The speed regulation capabilities of variable ratio traction drives are reviewed. A torsional stiffness analysis described suggests that traction contacts are relatively stiff compared to gears and are significantly stiffer than the other structural elements in the prototype CMG traction drive analyzed. Discussion is also given of an advanced turboprop propeller pitch change mechanism that incorporates a traction drive. Author

N85-33521*# United Kingdom Atomic Energy Authority, Risley (England). European space Tribology Lab.
THE PROPERTIES OF THIN-SECTION, FOUR-POINT-CONTACT BALL BEARINGS IN SPACE
Robert A. Rowntree *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 141-166 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 20K

Thin section, four-point-contact ball bearings are increasingly employed in spacecraft mechanisms because of the potential advantages they offer. However, little was previously known of their torque, thermal conductance and stiffness properties at conditions anticipated for their use in space. An investigation of these properties are described. It was found that frictional (Coulomb) torque, thermal conductance and stiffness all show marked dependence on the bearing preload, the housing design, the bearing external fit (i.e., free fit or interference) and on the thermal gradient across the races. Optimum bearing performance is achieved only if these properties are well understood. The necessary data to understand these properties are provided. Author

N85-33522*# Martin Marietta Aerospace, Denver, Colo.
THE DESIGN AND DEVELOPMENT OF A SPACECRAFT APPENDAGE TIE DOWN MECHANISM
William D. Nygren and Raymond Head *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 167-177 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 20K

The design and evolution is described of a spacecraft Appendage Tie Down Mechanism (ATDM). Particular emphasis is paid to the mechanical aspects of using dry lubricants to increase the efficiency of acme threads and worm gearing. The ATDM consists of five major components. These are a dc torque motor, a worm gear speed reducer, the tension bolt (or T-bolt), nut capture and centering jaws and the capture nut. In addition, there are several minor components such as limit switch assemblies and an antibackdrive mechanism which couples the drive motor to the worm shaft. A development model of the ATDM in various configurations was under test for some time. In its latest version, it has successfully completed thermal vacuum testing, vibration testing, and extended life testing. Author

N85-33523*# British Aerospace Public Ltd. Co., Stevenage (England).
THE USE OF PERFLUOROETHER LUBRICANTS IN UNPROTECTED SPACE ENVIRONMENTS c27
Bryan H. Baxter and Barry P. Hall *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 179-207 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 11H

A series of ball bearing tests in simulated space environment are described which determine durability of perfluoroether lubricants. The results of the examination of the test bearings for each stage are described and experimental techniques designed to overcome lubricant degradation are outlined. Author

N85-33524*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCES IN SPUTTERED AND ION PLATED SOLID FILM LUBRICATION c37
T. Spalvins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 209-224 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The glow discharge or ion assisted vacuum deposition techniques, primarily sputtering and ion plating, have rapidly emerged and offer great potential to deposit solid lubricants. The increased energizing of these deposition processes lead to improved adherence and coherence, favorable morphological growth, higher density, and reduced residual stresses in the film. These techniques are of invaluable importance where high precision machines tribo-components require very thin, uniform lubricating films (0.2 m), which do not interface with component tolerances. The performance of sputtered MoS2 films and ion plated Au and Pb films are described in terms of film thickness, coefficient of friction, and wear lives. Author

N85-33525*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
TELEPRESENCE WORK SYSTEM CONCEPTS c37
Lyle M. Jenkins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 225-233 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

Telepresence has been used in the context of the ultimate in remote manipulation where the operator is provided with the sensory feedback and control to perform highly dexterous tasks. The concept of a Telepresence Work Station (TWS) for operation in space is described. System requirements, concepts, and a development approach are discussed. The TWS has the potential for application on the Space Shuttle, on the Orbit Maneuver Vehicle, on an Orbit Transfer Vehicle, and on the Space Station. The TWS function is to perform satellite servicing tasks and construction and assembly operations in the buildup of large spacecraft. The basic concept is a pair of dexterous arms controlled from a remote station by an operation with feedback. It may be evolved through levels of supervisory control to a smart adaptive robotic system. Author

N85-33526*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DUAL ARM MASTER CONTROLLER DEVELOPMENT c37
D. P. Kuban (ORNL, Tenn.) and G. S. Perkins *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985

p 235-250 refs (For primary document see N85-33512 22-39) (Contract DE-AC05-84OR-21400)
Avail: NTIS HC A17/MF A01 CSCL 13M

The advanced servomanipulator (ASM) slave was designed with an anthropomorphic stance gear/torque tube power drives, and modular construction. These features resulted in increased inertia, friction, and backlash relative to tape driven manipulators. Studies were performed which addressed to human factor design and performance tradeoffs associated with the corresponding master controller best suited for the ASM. The results of these studies, as well as the conceptual design of the dual arm master controller, are presented. Author

N85-33527*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MAN-VEHICLE SYSTEMS RESEARCH FACILITY ADVANCED AIRCRAFT FLIGHT SIMULATOR THROTTLE MECHANISM c37
Seth S. Kurasaki and Wilbur C. Vallotton *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 251-257 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The Advanced Aircraft Flight Simulator is equipped with a motorized mechanism that simulates a two engine throttle control system that can be operated via a computer driven performance management system or manually by the pilots. The throttle control system incorporates features to simulate normal engine operations and thrust reverse and vary the force feel to meet a variety of research needs. While additional testing to integrate the work required is principally now in software design, since the mechanical aspects function correctly. The mechanism is an important part of the flight control system and provides the capability to conduct human factors research of flight crews with advanced aircraft systems under various flight conditions such as go arounds, coupled instrument flight rule approaches, normal and ground operations and emergencies that would or would not normally be experienced in actual flight. Author

N85-33528*# Tokyo Univ. (Japan). Inst. of Space and Astronautical Science.
THE DEVELOPMENT OF STAGING MECHANISMS FOR THE JAPANESE SATELLITE LAUNCHER Mu-3SII c37
Junjiro Onoda *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 259-276 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The staging mechanisms of the Japanese satellite launch vehicle Mu-3SII involving a unique separation and jettison mechanism for the nose fairing are described. The design requirements, the design features and the development problems are presented together with their solutions. Author

N85-33529*# Sperry Corp., Phoenix, Ariz. Space Systems Div.
A ROTATING ELECTRICAL TRANSFER DEVICE c37
Ryan S. Porter *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 277-291 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The design, development, and performance characteristics of two roll ring configurations - a roll ring being a device used in transferring electrical energy across a continuously rotating or oscillating interface through one or more flexible rolling contacts, or flexures are described. Emphasis is placed on the design problems and solutions encountered during development in the areas of flexure fatigue, contact electroplating, electrical noise, and control of interface geometry. Also, the present status of each configuration is summarized. Author

N85-33530*# Martin Marietta Aerospace, Denver, Colo.
A DUAL, FAULT-TOLERANT AEROSPACE ACTUATOR c37
Clete J. Siebert *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 293-303 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The requirements for mechanisms used in the Space Transportation System (STS) are to provide dual fault tolerance, and if the payload equipment violates the Shuttle bay door envelope, these deployment/restow mechanisms must have independent primary and backup features. The research and development of an electromechanical actuator that meets these requirements and will be used on the Transfer Orbit Stage (TOS) program is described. Author

N85-33531*# Sunstrand Energy Systems, Rockford, Ill.
DESIGN OF A DUAL FAULT TOLERANT SPACE SHUTTLE PAYLOAD DEPLOYMENT ACTUATOR c37
Duane R. Teske *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 305-313 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

As the Shuttle Transportation System (STS) becomes operational, the number and variety of payloads will increase. The need to deploy these cargo elements will require a variety of unique actuator designs, all of which will have to conform with STS safety policy. For those missions where payload operations extend beyond the payload bay door envelope, this policy deems the prevention of door closure as a catastrophic hazard. As such, it must be controlled by independent, primary and backup methods. The combination of these methods must be two fault tolerant. The design of such an actuator is described. The device consists of a single linear ballscrew with two ballnuts, each ballnut forming an independent actuator using the common ballscrew. The design requirements, concept development, hardware configuration, and fault tolerance rationale are highlighted. Author

N85-33532*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
FEATURES OF THE SOLAR ARRAY DRIVE MECHANISM FOR THE SPACE TELESCOPE c37
Raimund G. Hostenkamp *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 315-327 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The solar array drive mechanism for the Space Telescope embodies several features not customarily found on solar array drives. Power and signal transfer is achieved by means of a flexible wire harness for which the chosen solution, consisting of 168 standard wires, is described. The torque performance data of the harness over its temperature range are presented. The off load system which protects the bearings from the launch loads is released by a trigger made from Nitinol, the memory alloy. The benefits of memory alloy and the caveats for the design are briefly discussed. The design of the off load system is described and test experience is reported. Author

N85-33533*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
APPENDAGE DEPLOYMENT MECHANISM FOR THE HUBBLE SPACE TELESCOPE PROGRAM c37
Herbert T. Greenfield *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 329-346 ref Sponsored by NASA. Marshall Space Flight Center (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

The key requirements, a design overview, development testing (qualification levels), and two problems and their solutions resolved during the mechanism development testing phase are presented. The mechanism described herein has demonstrated its capability to deploy/restow two large Hubble Space Telescope deployable appendages in a varying but controlled manner. Author

N85-33534*# Hughes Aircraft Co., El Segundo, Calif.
SIX MECHANISMS USED ON THE SSM/1 RADIOMETER c37
Howard R. Ludwig *In* NASA. Ames Research Center 19th Aerospace Mech. Symp. Aug. 1985 p 347-362 refs (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

Future USAF Block 5D Defense Meteorological Satellites will

carry a scanning microwave radiometer sensor (SSM/1). SSM/1 senses the emission of microwave energy and returns to Earth data used to determine weather conditions, such as rainfall rates, soil moisture, and oceanic wind speed. The overall design of the SSM/1 radiometer was largely influenced by the mechanisms. The radiometer was designed to be stowed in a cavity on the existing spacecraft. The deployment of the sensor is complex due to the constraint of this cavity and the need for precision in the deployment. The radiometer will continuously rotate, instead of oscillate, creating the need for a bearing and power transfer assembly and a momentum compensation device. The six mechanisms developed for this program are described. Author

N85-33535*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CIRCULATION CONTROL LIFT GENERATION EXPERIMENT: HARDWARE DEVELOPMENT c37
Tina L. Panontin *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 363-378 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

A circulation control airfoil and its accompanying hardware were developed to allow the investigation of lift generation that is independent of airfoil angle of attack and relative flow velocity. The test equipment, designed for use in a water tunnel, includes the blown airfoil, the support systems for both flow visualization and airfoil load measurement, and the fluid control system, which utilizes hydraulic technology. The primary design tasks, the selected solutions, and the unforseen problems involved in the development of these individual components of hardware are described. Author

N85-33536*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TWO-PLANE BALANCE AND SLIP-RING DESIGN c37
Phil M. Luna *In its* 19th Aerospace Mech. Symp. Aug. 1985 p 379-387 (For primary document see N85-33512 22-39)
Avail: NTIS HC A17/MF A01 CSCL 13M

A 3.25 cm (1.28 in.) two plane balance and eight channel slip ring assembly has been designed to measure and transmit the thrust (667-N;150-lb) and torque (135-N-m;100-lb-ft) components produced by wind tunnel model turboprops and drive motors operating at 300 Hz. Author

N85-33537*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
JOINT DESIGN FOR IMPROVED FATIGUE LIFE OF DIFFUSION-BONDED BOX-STIFFENED PANELS
Randall C. Davis, Paul L. Moses (PRC Kentron, Inc.), and Russell S. Kanenko (Lockheed California Co., Burbank) Washington Sep. 1985 18 p refs
(NASA-TP-2480; L-15967; NAS 1.60:2480) Avail: NTIS HC A02/MF A01 CSCL 20K

Simple photoelastic models were used to identify a cross-section geometry that would eliminate the severe stress concentrations at the bond line between box stiffeners diffusion bonded to a panel skin. Experimental fatigue-test data from titanium test specimens quantified the allowable stress in terms of cycle life for various joint geometries. It is shown that the effect of stress concentration is reduced and an acceptable fatigue life is achieved. E.A.K.

N85-33538*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SELECTING STEP SIZES IN SENSITIVITY ANALYSIS BY FINITE DIFFERENCES
Jocelyn Iott (Virginia Polytechnic Inst. and State Univ., Blacksburg), Raphael T. Haftka (Virginia Polytechnic Inst. and State Univ., Blacksburg), and Howard M. Adelman Aug. 1985 14 p refs
(NASA-TM-86382; L-15938; NAS 1.15:86382) Avail: NTIS HC A02/MF A01 CSCL 20K

This paper deals with methods for obtaining near-optimum step sizes for finite difference approximations to first derivatives with particular application to sensitivity analysis. A technique denoted the finite difference (FD) algorithm, previously described in the literature and applicable to one derivative at a time, is extended to the calculation of several simultaneously. Both the original and extended FD algorithms are applied to sensitivity analysis for a data-fitting problem in which derivatives of the coefficients of an interpolation polynomial are calculated with respect to uncertainties in the data. The methods are also applied to sensitivity analysis of the structural response of a finite-element-modeled swept wing. In a previous study, this sensitivity analysis of the swept wing required a time-consuming trial-and-error effort to obtain a suitable step size, but it proved to be a routine application for the extended FD algorithm herein. Author

N85-33539*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STRUCTURAL DYNAMICS MODEL AND RESPONSE OF THE DEPLOYABLE REFERENCE CONFIGURATION SPACE STATION
Jerrold M. Housner May 1985 93 p
(NASA-TM-86386; NAS 1.15:86386) Avail: NTIS HC A05/MF A01 CSCL 20K

The analytical models and results of a structural dynamics investigation of the reference initial operation and evolutionary configurations of the nine foot bay space station are presented. This investigation was carried out between April and August 1984 as part of a team effort to define a reference configuration for the first U.S. manned space station. The results presented herein serve as a guide, a point of departure and a standard for future NASA and contractor studies leading to the design of the Space Station. The reference initial operation configuration of the nine foot bay station was found to be very flexible, with its lowest mode between 0.096 and 0.138 Hertz depending on station attachments. However, for the transient load cases which were then available, internal member loads had positive margins of safety and preliminary results indicate that laboratory experiments which require quiescent conditions can be satisfied down to the order of 0.0001 g's. Author

N85-33540*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
ELEVATED TEMPERATURE CRACK GROWTH Annual Report
J. F. Yau, S. N. Malik, K. S. Kim, R. H. VanStone, and J. H. Laflen Aug. 1985 71 p refs
(Contract NAS-23940)
(NASA-CR-174957; NAS 1.26:174957; ASR-1) Avail: NTIS HC A04/MF A01 CSCL 20K

The objective of the Elevated Temperature Crack Growth Project is to evaluate proposed nonlinear fracture mechanics methods for application to combustor liners of aircraft gas turbine engines. During the first year of this program, proposed path-independent (P-I) integrals were reviewed for such applications. Several P-I integrals were implemented into a finite-element postprocessor which was developed and verified as part of the work. Alloy 718 was selected as the analog material for use in the forthcoming experimental work. A buttonhead, single-edge notch specimen was designed and verified for use in elevated-temperature strain control testing with significant inelastic strains. A crack mouth opening displacement measurement device was developed for further use. Author

N85-33541*# General Electric Co., Cincinnati, Ohio. Advanced Technology Programs Dept.
A REVIEW OF PATH-INDEPENDENT INTEGRALS IN ELASTIC-PLASTIC FRACTURE MECHANICS, TASK 4 Interim Report
K. S. Kim Aug. 1985 33 p refs
(Contract NAS3-23940)
(NASA-CR-174956; NAS 1.26:174956) Avail: NTIS HC A03/MF A01 CSCL 20K

The path independent (P-I) integrals in elastic plastic fracture mechanics which have been proposed in recent years to overcome the limitations imposed on the J integral are reviewed. The P-I integrals considered herein are the J integral by Rice, the thermoelastic P-I integrals by Wilson and Yu and by Gurtin, the J* integral by Blackburn, the J sub theta integral by Ainsworth et

al., the J integral by Kishimoto et al., and the delta T sub p and delta T* sub p integrals by Atluri et al. The theoretical foundation of these P-I integrals is examined with emphasis on whether or not path independence is maintained in the presence of nonproportional loading and unloading in the plastic regime, thermal gradients, and material inhomogeneities. The similarities, differences, salient features, and limitations of these P-I integrals are discussed. Comments are also made with regard to the physical meaning, the possibility of experimental measurement, and computational aspects. Author

N85-33542*# Texas Univ., Austin. Center for Aeronautical Research.
A SUBSTRUCTURE COUPLING PROCEDURE APPLICABLE TO GENERAL LINEAR TIME-INVARIANT DYNAMIC SYSTEMS
Thomas G. Howsman and Roy R. Craig, Jr. May 1984 88 p refs Previously announced in IAA as A84-31702
(Contract NAS8-35338)
(NASA-CR-176144; NAS 1.26:176144; CAR-84-1) Avail: NTIS HC A05/MF A01 CSCL 02K

A substructure synthesis procedure applicable to structural systems containing general nonconservative terms is presented. In their final form, the nonself-adjoint substructure equations of motion are cast in state vector form through the use of a variational principle. A reduced-order mode for each substructure is implemented by representing the substructure as a combination of a small number of Ritz vectors. For the method presented, the substructure Ritz vectors are identified as a truncated set of substructure eigenmodes, which are typically complex, along with a set of generalized real attachment modes. The formation of the generalized attachment modes does not require any knowledge of the substructure flexible modes; hence, only the eigenmodes used explicitly as Ritz vectors need to be extracted from the substructure eigenproblem. An example problem is presented to illustrate the method. Author (IAA)

N85-33543*# Texas Univ., Austin. Bureau of Engineering Research.
SUBSTRUCTURE COUPLING IN THE FREQUENCY DOMAIN
May 1985 128 p refs
(Contract NAS8-35338)
(NASA-CR-176140; NAS 1.26:176140; CAR-85-1) Avail: NTIS HC A07/MF A01 CSCL 20K

Frequency domain analysis was found to be a suitable method for determining the transient response of systems subjected to a wide variety of loads. However, since a large number of calculations are performed within the discrete frequency loop, the method loses it computational efficiency if the loads must be represented by a large number of discrete frequencies. It was also discovered that substructure coupling in the frequency domain work particularly well for analyzing structural system with a small number of interface and loaded degrees of freedom. It was discovered that substructure coupling in the frequency domain can lead to an efficient method of obtaining natural frequencies of undamped structures. It was also found that the damped natural frequencies of a system may be determined using frequency domain techniques. E.R.

N85-33544*# Texas Univ., Austin. Bureau of Engineering Research.
MULTISHAKER MODAL TESTING Final Report
Roy R. Craig, Jr. May 1985 17 p refs
(Contract NAS8-35338)
(NASA-CR-176139; NAS 1.26:176139; CAR-85-3) Avail: NTIS HC A02/MF A01 CSCL 20K

A component mode synthesis method for damped structures was developed and modal test methods were explored which could be employed to determine the relevant parameters required by the component mode synthesis method. Research was conducted on the following topics: (1) Development of a generalized time-domain component mode synthesis technique for damped systems; (2) Development of a frequency-domain component mode synthesis method for damped systems; and (3) Development of a system identification algorithm applicable to general damped systems. Abstracts are presented of the major publications which have been previously issued on these topics. Author

N85-33545*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
STRESSES AND DEFORMATIONS IN CROSS-PLY COMPOSITE TUBES SUBJECTED TO A UNIFORM TEMPERATURE CHANGE: ELASTICITY AND APPROXIMATE SOLUTIONS Interim Report, Jun. 1984 - Jun. 1985
M. W. Hyer, David E. Cooper, and D. Cohen Jun. 1985 50 p
(Grant NAG1-343)
(NASA-CR-176147; NAS 1.26:176147; COMS-85-06; VPI-E-85-15; IR-51) Avail: NTIS HC A03/MF A01 CSCL 20K

The effects of a uniform temperature change on the stresses and deformations of composite tubes are investigated. The accuracy of an approximate solution based on the principle of complementary virtual work is determined. Interest centers on tube response away from the ends and so a planar elasticity approach is used. For the approximate solution a piecewise linear variation of stresses with the radial coordinate is assumed. The results from the approximate solution are compared with the elasticity solution. The stress predictions agree well, particularly peak interlaminar stresses. Surprisingly, the axial deformations also agree well. This, despite the fact that the deformations predicted by the approximate solution do not satisfy the interface displacement continuity conditions required by the elasticity solution. The study shows that the axial thermal expansion coefficient of tubes with a specific number of axial and circumferential layers depends on the stacking sequence. This is in contrast to classical lamination theory which predicts the expansion to be independent of the stacking arrangement. As expected, the sign and magnitude of the peak interlaminar stresses depends on stacking sequence. B.W.

N85-33546*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Mechanics.
NONLINEAR RESPONSE AND FAILURE CHARACTERISTICS OF INTERNALLY PRESSURIZED COMPOSITE CYLINDRICAL PANELS
Richard L. Boitnott, Eric R. Johnson, and James H. Starnes Jun. 1985 207 p refs
(Contract NCC1-15)
(NASA-CR-176148; NAS 1.26:176148; COMS-85-07; VPI-E-85-16; IR-52) Avail: NTIS HC A10/MF A01 CSCL 20K

Results of an experimental and analytical study of the nonlinear response and failure characteristics of internally pressurized 4- to 16-ply-thick graphite-epoxy cylindrical panels are presented. Specimens with clamped boundaries simulating the skin between two frames and two stringers of a typical transport fuselage were tested to failure. Failure results of aluminum specimens are compared with the graphite-epoxy test results. The specimens failed at their edges where the local bending gradients and interlaminar stresses are maximum. STAGS nonlinear two-dimensional shell analysis computer code results are used to identify regions of the panels where the response is independent of the axial coordinate. A geometrically nonlinear one-dimensional cylindrical panel analysis was derived and used to determine panel response and interlaminar stresses. Inclusion of the geometric nonlinearity was essential for accurate prediction of panel response. The maximum stress failure criterion applied to the predicted tensile stress in the fiber direction agreed best with the experimentally determined first damage pressures. B.W.

N85-33547*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
THE STRESS DISTRIBUTION IN PIN-LOADED ORTHOTROPIC PLATES Interim Report
E. C. Klang and M. W. Hyer Jun. 1985 170 p refs
(Grant NAG1-343)
(NASA-CR-176146; NAS 1.26:176146; CCMS-85-05; VPI-E-85-13; IR-50) Avail: NTIS HC A08/MF A01 CSCL 20K

The performance of mechanically fastened composite joints was studied. Specially, a single-bolt connector was modeled as a

pin-loaded, infinite plate. The model that was developed used two dimensional, complex variable, elasticity techniques combined with a boundary collocation procedure to produce solutions for the problem. Through iteration, the boundary conditions were satisfied and the stresses in the plate were calculated. Several graphite epoxy laminates were studied. In addition, parameters such as the pin modulus, coefficient of friction, and pin-plate clearance were varied. Conclusions drawn from this study indicate: (1) the material properties (i.e., laminate configuration) of the plate alter the stress state and, for highly orthotropic materials, the contact stress deviates greatly from the cosinusoidal distribution often assumed; (2) friction plays a major role in the distribution of stresses in the plate; (3) reversing the load direction also greatly effects the stress distribution in the plate; (4) clearance (or interference) fits change the contact angle and thus the location of the peak hoop stress; and (5) a rigid pin appears to be a good assumption for typical material systems. Author

N85-33548# Sandia Labs., Albuquerque, N. Mex.
LOW TEMPERATURE EXPERIMENTAL CAPABILITY FOR USE WITH GAS GUNS
J. M. Miller and L. C. Chhabildas Apr. 1985 24 p
(Contract DE-AC04-76DP-00789)
(DE85-010418; SAND-85-0303) Avail: NTIS HC A02/MF A01

An experimental facility which has the capability of conducting low-temperature experiments on the single-stage light gas gun located at the Sandia Shock Thermodynamics and Applied Research (STAR) Facility is described. The system in unique in what it allows the use of presently developed techniques, such as window interferometry or pressure-shear loading, to determine the dynamic shock response of materials at low temperatures. Measurements of impact misalignment between the projectile and the target and measurements of velocity interferometer fringe data on shocked specimens have shown that the addition of the low-temperature capability has not compromised the quality of dynamic shock data, as compared to room-temperature measurements. The low-temperature capability can be easily modified for use with other gun facilities. DOE

N85-33549# Los Alamos Scientific Lab., N. Mex.
SLIDELINE VERIFICATION FOR MULTILAYER PRESSURE VESSELS AND PIPING ANALYSIS INCLUDING STRAIN HARDENING
I. A. VanGulick 1985 23 p refs Presented at ASME Pressure Vessel and Piping Div. Conf., New Orleans, 24 Jun. 1985
(Contract W-7405-eng-36)
(DE85-005816; LA-UR-85-158; CONF-850670-2) Avail: NTIS HC A02/MF A01

Nonlinear finite element computer codes with slideline algorithm implementations are useful for the analysis of prestressed pressure vessels and piping. This paper presents closed form solutions including the effects of linear strain hardening useful for verifying slideline implementations for this application. The solutions describe stresses and displacements of an internally pressurized inner sphere initially separated from an outer sphere by a uniform gap. Linear strain hardening material behavior following yield for the inner sphere and elastic material behavior for the outer sphere are assumed. Comparison of closed form and finite element results evaluates the usefulness of the closed form solutions and the validity of the slideline implementation used. DOE

N85-33550# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Reaktorsicherheit.
PRESTRESSED CONCRETE VESSEL ACCORDING TO THE HOT LINER CONCEPT: A CRITICAL EVALUATION OF EXPERIMENTAL RESULTS WITH A PROTOTYPE VESSEL
Helmut Zemann, Alfons Witt, Reinhold Scheiber, and Siegfried Grasegger Jan. 1985 27 p refs In GERMAN; ENGLISH summary
(OEFZS-4313; RS-248/85) Avail: NTIS HC A03/MF A01

The static behavior of a prototype vessel for prestressed concrete, particularly the interaction of structural parts in the pressure-temperature cycle, is reviewed. Experimental and operational experience gained from long term tests enable a critical examination of the concept of an elastic hot liner and adjustable elevated wall temperature. Complex, large volume, high stress vessels, whose dynamic behavior allows a fast, economical adaptation of the operation state to changing process parameters can be built. Author (ESA)

N85-33551# Technical Research Centre of Finland, Espoo. Metals Lab.
MECHANICAL PROPERTIES OF SHIELDED METAL ARC (SMA) AND SUBMERGED ARC (SA) WELDED JOINTS IN A STEEL RAEX 386 P ARCTIC
Martti Vilpas, Hannele Tihekari, Kim Wallin, and Risto Karppi Jan. 1985 27 p refs Prepared in cooperation with Technische Hochschule
(VTT-339; ISBN-951-38-2235-4; ISSN-0358-5077) Avail: NTIS HC A03/MF A01

Mechanical properties of shielded metal arc and submerged arc welded joints of normalized steel were tested using hardness, tensile, Charpy-V, and fracture mechanics testing. Results show reasonably good strength and toughness properties compared to the base material. The ductile-brittle transition behavior of the joints welded with the arc energies of 17, 30 and 50 kJ/cm is, however, located at considerably higher temperatures than that of the base material. The kJ-test results show that arc energy should be kept low (17 kJ/cm) to achieve good fracture toughness properties in welded joints of the steel. The influence of arc energy on toughness is more pronounced in the fracture mechanics tests than in the Charpy-V tests, due to the use of full thickness test specimens in the fracture mechanics tests, in which the fracture toughness is also affected by the properties in the weld root. This effect is not seen in the Charpy-V tests, the specimens of which were taken from the surface area of the joints. Author (ESA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-33552*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CRUSTAL DYNAMICS PROJECT: CATALOGUE OF SITE INFORMATION
Aug. 1985 407 p refs Previously announced as N85-23258
(NASA-TM-86218; Rept-85B0413; NAS 1.15:86218; X-601-85-6) Avail: NTIS HC A18/MF A01 CSCL 08G

This document represents a catalogue of site information for the Crustal Dynamics Project. It contains information and descriptions of those sites used by the Project as observing stations for making the precise geodetic measurements useful for studies of the Earth's crustal movements and deformation. Author

N85-33553# Army Enlisted Evaluation Center, Indianapolis, Ind. Environmental Lab.
MILITARY HYDROLOGY. REPORT 9: STATE-OF-THE-ART REVIEW AND ANNOTATED BIBLIOGRAPHY OF DAM-BREACH FLOOD FORECASTING
R. A. Wurbs Feb. 1985 154 p
(AD-A155383; WES/MP/EL-79-6-9) Avail: NTIS HC A08/MF A01 CSCL 08/8

This report provides a general overview of the current state of the art of dam-breach flood wave analysis. The subject addressed can be divided into two modeling tasks: (1) computation of the reservoir outflow hydrograph for a given reservoir inflow hydrograph and set of breach characteristics; and (2) computation of the discharges, velocities, and stages that occur at various locations and times as the flood wave moves through the downstream valley. The review was accomplished with a view toward using the information for military applications, such as rapid mobility barrier planning and evaluation. The review of available models is based on a comprehensive literature survey, supplemented by discussion, with a number of model developers and users. An annotated bibliography is included. GRA

N85-33554# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Geology.
DEEP-BURIAL DIAGENESIS IN CARBONATES Final Report, 16 Jan. 1984 - 31 Mar. 1985
G. M. Friedman Mar. 1985 30 p refs
(Contract DE-AC02-81ER-10921)
(DE85-011224; DOE/ER-10921/T2) Avail: NTIS HC A03/MF A01

An understanding of what makes or breaks porosity in carbonate rocks as a result of deep-burial, is sought as well as to develop criteria for deep-burial diagenesis in carbonate rocks, and to apply these criteria for interpretation of carbonate rocks now at shallow depth. Compacting tests reveal that ooid samples show substantial reductions of bulk-volume and porosity when squeezed at temperatures and pressures comparable to overburden of 3.5 to 6.5 km. Particle breakage and deformed particle contacts developed that are comparable to those reported from oolites from the rock record. Reproducibility of pressure solution by compaction supports the conclusion that initial pore-volume reduction through mechanical grain adjustments and ultimate pressure solution are major processes in the diagenetic evolution of limestone. Studies reveal that corrected measurement of bulk densities yield improved estimates of true porosity and water saturation. The mechanism of burial dolomitization was suggested to be the underlying marine Sylvan shale which provided necessary Mg+2 and Fe+2 during smectite-to-illite transition. Also detailed studies of core samples and thin sections from the Lower Ordovician Ellenberger carbonate rocks in the Permian Basin demonstrated that carbonate rocks below 10,000 ft are exclusively dolostone showing some evidence of deep-burial dolomitization. DOE

N85-33555# Northwest Economic Associates, Vancouver, Wash.
DEFICIT IRRIGATION FEASIBILITY STUDY AND DEMONSTRATION PROJECT
Mar. 1985 191 p refs
(Contract DE-AC79-84EP-15109)
(DE85-011531; DOE/BP-15109/T1) Avail: NTIS HC A09/MF A01

Current irrigation practices in the Region are oriented toward maximizing crop yield, often resulting in wasted water and energy. Conservation of both water and energy can be achieved by scheduling the times and quantities of water applications to meet actual crop demands. Additional energy savings can be derived by scheduling irrigation based on optimum profit and not yield. This optimization is based on the fact that some crops can sustain significant reductions in water application while suffering only a small reduction in yield. This technique, known as deficit irrigation, allows the farmer to balance the costs of production against the economic return for his crops. Purpose of this project is to demonstrate and document deficit irrigation on farms in the Pacific Northwest. DOE

N85-33556# Rockwell International Corp., Richland, Wash.
STOCHASTIC GROUNDWATER FLOW MODELING USING THE SECOND-ORDER METHOD
B. Sagar and P. M. Clifton Mar. 1984 32 p refs Presented at the 17th Intern. Assoc. of Hydrologists Intern. Congr., Tucson, Ariz., 7 Jan. 1985
(Contract DE-AC06-77RL-01030)
(DE85-011250; RHO-BW-SA-364P; CONF-850170-3) Avail: NTIS HC A03/MF A01

Stochastic groundwater flow modeling by means of a second order uncertainty analysis technique is discussed. This technique is based on a Taylor series expansion of the state variables of interest (hydraulic heads and Darcian velocities) about the expected values of the model parameters. The method was incorporated into the computer code PORSTAT, which solves the two dimensional stochastic groundwater flow equation coupled with the deterministic heat transfer and mass transport equation using integrated finite differences coupled to a direct-equation solver. The output from PORSTAT consists of the expected values, variances, and covariances of hydraulic heads and Darcian velocities. The application of PORSTAT to a sample problem is also presented. This problem was also solved by means of a Monte Carlo groundwater flow program (PORMC) to assess the accuracy of the second-order method. It was observed that as the coefficient of variation of the input parameters increases, the difference between the standard deviations predicted by PORSTAT and those predicted by Monte Carlo codes increases. DOE

N85-33557# Systems Science and Software, La Jolla, Calif.
WIPP HORIZON IN SITU PERMEABILITY MEASUREMENTS Final Report
E. Peterson, P. Lagus, J. Brown, and K. Lie Jan. 1985 102 p
(Contract DE-AC04-76DP-00789)
(DE85-012687; SAND-85-7166) Avail: NTIS HC A06/MF A01

Eighteen gas permeability tests were conducted at the Waste Isolation Pilot Plant (WIPP) facility horizon in southeastern New Mexico. The permeability and porosity of the competent salt, the permeability variation with distance from the mined surface, and the influence of the interspersed clay and anhydrite seams on the measured permeability values were determined. Six short duration order-of-magnitude permeability tests were performed. Two types of tests were performed. In one test the downhole pressure was maintained at an approximate constant value and the resulting flow measured. In the second, the test region was pressurized, then shut-in, and the pressure decay subsequently monitored. The resulting data were then used to infer permeability and porosity values. The test system and test technique used were designed to evaluate formations having permeability to porosity ratios as low as .0001 darcy. This downhole measurement system consisted of a dual packer assembly which isolated a test interval and adjacent guard interval. During a test, the test interval pressure, temperature, and flow were measured. DOE

N85-33558# Research Inst. of National Defence, Linkoeping (Sweden).
HIERARCHICAL CHAMFER MATCHING
Gunilla Borgefors Apr. 1985 88 p refs
(FOA-C-30387-E1; ISSN-0347-3708) Avail: NTIS HC A05/MF A01; Research Institute of National Defence, Stockholm KR 50

A hierarchical chamfer matching algorithm for matching edges in digital images is presented. It is reasonably insensitive to noise, and the initial guess of the relative positions of the edges needs not be good, because the algorithm uses a hierarchical structure. Examples of applications are: (1) registration of digital images; (2) simultaneous display and information integration of images from different sensors; (3) change detection; (4) navigation; and (5) object recognition. Aerial photograph registration (e.g., transformation into map coordinates) illustrates the algorithm; the photograph is translated, rotated, and changed in scale and perspective. Author (ESA)

N85-33559# Lewin and Associates, Inc., Washington, D. C.
GEOLOGIC, TECHNICAL, AND ECONOMIC SENSITIVITY ANALYSIS IN SUPPORT OF THE GRI (GASE RESEARCH INSTITUTE) TIGHT GAS RESERVOIRS PROJECT AREA Annual Report, Nov. 1983 - Nov. 1984
F. Morra and J. P. Brashear Feb. 1985 100 p Sponsored by Gas Research Inst.

(PB85-192276; GRI-85/0094; Rept-85-0817) Avail: NTIS HC A05/MF A01 CSCL 05A

During 1982 to 1983, Lewin and Associates, Inc. developed the Tight Gas Analysis System (TGAS) as a planning and assessment tool for both GRI and the DOE. During this reporting period Nov. 1983 to Nov. 1984, TGAS was used to support the GRI Tight Gas Reservoirs Project area in three tasks: (1) evaluation of benefits of the entire program and its subcomponents; (2) detailed analysis of a single formation (the Travis Peak); and (3) fine grain assessment of the role of information in the decision to drill, develop and produce a flight gas prospect. DOE

N85-33560# Bureau of Mines, Albany, Oreg.
THERMODYNAMIC DATA FOR MINERAL TECHNOLOGY Bulletin, Mar. 1982 - Mar. 1984
L. B. Pankratz, J. M. Stuve, and N. A. Gokcen 1985 362 p (PB85-184331; BM-B-677; LC-84-600195) Avail: NTIS HC A16/MF A01 CSCL 07D

Thermodynamic data on the elements, oxides, sulfides, halides, and selected hydrides, carbides, nitrides, carbonates, sulfates, silicates, and miscellaneous compounds were reviewed, evaluated, and compiled. Values for C(sub P), S, H-H(sub 298), delta HF, and delta Gf are given in tabular form. A brief thermodynamic background and a number of examples and applications are presented. GRA

N85-33130# Joint Publications Research Service, Arlington, Va.
COSMONAUTS PARTICIPATE IN MULTILEVEL REMOTE SENSING EXPERIMENT Abstract Only
N. Barskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 23 Transl. into ENGLISH from Bakinskiy Rabochiy (Maku), 30 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33148# Joint Publications Research Service, Arlington, Va.
ENHANCING PRECISION OF REMOTE TEMPERATURE SENSING DATA FROM SATELLITES UNDER CLOUDY ATMOSPHERIC CONDITIONS Abstract Only
Yu. V. Plokhenko and A. B. Uspenskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 119 Transl. into ENGLISH from Issled. Zemli Iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 15-22 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33149# Joint Publications Research Service, Arlington, Va.
IMPACT OF FLUCTUATIONS IN OPTICAL PROPERTIES OF ATMOSPHERE ON THE RATIO OF SPECTRAL BRIGHTNESS FROM REMOTE SENSING OF AGRICULTURAL LAND Abstract Only
Sh. A. Akhmedov and D. A. Usikov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 120 Transl. into ENGLISH from Issled. Zemli Iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 23-24 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33150# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF ALTITUDE OF CLOUD COVER TOP FROM METEOR SATELLITE DATA Abstract Only
L. I. Koprova and A. Ye. Bakhamatov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 120-121 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 25-34 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33151# Joint Publications Research Service, Arlington, Va.
LANDSCAPE INTERPRETATION CAPABILITIES USING SPACE PHOTOGRAPHS OF REGIONS OF A MULTISTAGE PLATFORM MANTLE STRUCTURE Abstract Only
O. S. Obryadchikov and S. Ye. Petrov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 121-122 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 35-43 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33152# Joint Publications Research Service, Arlington, Va.
INTERPRETATION OF MULTIBAND PHOTOGRAPHS MADE DURING TELEFOTO-80 EXPERIMENT FOR THE PURPOSE OF DISCRIMINATING AGRICULTURAL CROPS Abstract Only
R. Kachinski *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 122 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 44-47 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33153# Joint Publications Research Service, Arlington, Va.
USE OF SPACE PHOTOGRAPHS FOR ANALYSIS OF STRUCTURAL AND DYNAMIC CONDITIONS OF FORMATION OF ANCIENT PHLOGOPITE AND APATITE DEPOSITS Abstract Only
Kh. G. Zinatov and R. F. Vafin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 123 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 48-54 Original language document previously announced in IAA as A84-34781 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33154# Joint Publications Research Service, Arlington, Va.
USING REMOTE PHOTOGRAPHS IN PROSPECTING FOR HYDROCARBONS ON THE KERCH PENINSULA Abstract Only
V. I. Khnykin and N. V. Kolodiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 124 Transl. into ENGLISH from from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 55-59 Original language document previously announced in IAA as A84-34782 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33155# Joint Publications Research Service, Arlington, Va.
CATALOGING THE SPECTRAL BRIGHTNESS COEFFICIENTS OF THE FORESTED REGION OF THE EUROPEAN TERRITORY OF THE USSR Abstract Only
Yu. K. Ross and U. K. Peterson *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 124 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 60-66 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33156# Joint Publications Research Service, Arlington, Va.
REGRESSION ANALYSIS OF AIRCRAFT AND GROUND MEASUREMENT DATA ON VEGETATION COVER Abstract Only
O. Ya. Klimenko and V. V. Kozoderov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 125 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 67-75 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33157# Joint Publications Research Service, Arlington, Va.
DIRECT REGRESSION ANALYSIS OF REMOTE SENSING DATA (USING EXAMPLE OF GRASS COVER) Abstract Only
B. M. Balter and M. Ganzorig *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 125-126 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 76-86 Original language document previously announced in IAA as A84-34785 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33158# Joint Publications Research Service, Arlington, Va.
INTERACTIVE PROCEDURES FOR DISCRIMINATING AND RESTORING CONTOUR LINE NETWORKS Abstract Only
R. I. Elman *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 126-127 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 87-97 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33159# Joint Publications Research Service, Arlington, Va.
TERRAIN ILLUMINATION CONDITIONS WHEN TAKING SCAN-

NING PHOTOGRAPHS FROM SPACE Abstract Only
A. M. Kuzina, I. G. Maltseva, and N. S. Ramm *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 127 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 98-106 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33160# Joint Publications Research Service, Arlington, Va.
CALCULATING SOLAR HIGHLIGHT AND SHADELESS AREAS FOR SCANNING PHOTOGRAPHS FROM SPACE AND OPTIMIZING LIGHTING CONDITIONS Abstract Only
I. G. Maltseva *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 128 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 107-116 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33161# Joint Publications Research Service, Arlington, Va.
DISCRIMINATION OF LINEAR CONTOUR ELEMENTS OF SPACE PHOTOGRAPHS BASED ON VISUAL PERCEPTION MODEL Abstract Only
M. V. Smirnov and L. N. Rozanov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 129 Transl. into ENGLISH from Issled. Zemli iz Kosmosa (Moscow), no. 2, Mar. - Apr. 1984 p 117-124 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33162# Joint Publications Research Service, Arlington, Va.
PHYSICO-GEOGRAPHICAL REGIONALIZATION OF CASPIAN LOWLAND BASED ON SPACE SURVEY MATERIALS Abstract Only
I. V. Kopyl and V. A. Nikolayev *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 130 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 1, Jan. - Feb. 1984 p 65-70 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33163# Joint Publications Research Service, Arlington, Va.
MAPPING OF DYNAMICS OF DELTAS BY SPACE PHOTOGRAPHY Abstract Only
O. N. Yefremova and V. I. Kravtsova *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 130-131 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 1, Jan. - Feb. 1984 p 70-81 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33164# Joint Publications Research Service, Arlington, Va.
COMPREHENSIVE MAPPING OF ARID TERRITORIES OF ARIZONA USING SPACE PHOTOGRAPHY Abstract Only
Ye. V. Glushko and T. I. Kondratyeva *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 131 Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. 5: Geografiya (Moscow), no. 3, May - Jun. 1984 p 72-77 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33165# Joint Publications Research Service, Arlington, Va.
REPETITION OF DENSE CLOUD COVER ABOVE INDIAN OCEAN FROM GENERALIZED SATELLITE DATA Abstract Only
R. V. Abramov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 132 Transl. into ENGLISH from Izv. Vsesoyuznogo Geograficheskogo Obshchestva (Leningrad), v. 116, no. 2, Mar. - Apr. 1984 p 138-144 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-33561# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
FAILURE TESTING OF ACTIVE SOLAR ENERGY SYSTEM COMPONENTS
Robert B. Farrington Jul. 1984 74 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013024; SERI/TR-253-2187) Avail: NTIS HC A04/MF A01

Component and system reliability of active solar energy systems continue to be a major concern of designers, manufacturers, installers, and consumers. Six test loops were constructed, to thermally cycle active solar energy system components. Drain valves, check valves, air vents, vacuum breakers, tempering valves, and polybutylene pipe were included in the testing. The test methods and results are discussed. Test results show poor reliability of some of the components and limited performance from others. The results lead to a better understanding of certain failures in the field and present designers with realistic expectations for these components. Recommendations are given to improve component reliability and for further testing. Author

N85-33562# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
AN ANALYSIS OF THE EFFECTS OF ACTIVE SOLAR ENERGY SYSTEM CONTROL SENSOR DEGRADATION ON SYSTEM PERFORMANCE
R. B. Farrington and W. Short Jul. 1984 31 p refs
(Contract DE-AC02-83CH-10093)
(DE84-013023; SERI/TR-253-2185) Avail: NTIS HC A03/MF A01

Varying the differential-off setpoints has been thought to contribute only additional parasitic energy costs. The effect of varying the differential-off setpoint is much more significant than that. Laboratory testing has shown that sensor response can drift by as much as 12 C. The sensor testing and results are briefly reviewed. A negative differential-off setpoint results in the continued pump circulation keeping the collector sensor warmer than the ambient air, and in fact, it will keep it very close to the storage tank temperature. As a result, the pump will continue to operate with no irradiation leading to high thermal losses. Analytical expressions are developed and presented that determine the ambient air temperature required to turn the pump off as a function of the (negative) differential-off setpoint and storage tank temperature. The results show that a negative differential setpoint can effectively reduce the net collected energy by 50% and increase the auxiliary energy requirements by 300%. Author

N85-33563*# Toledo Univ., Ohio.
AERODYNAMIC ANALYSIS OF A HORIZONTAL AXIS WIND TURBINE BY USE OF HELICAL VORTEX THEORY, VOLUME 2: COMPUTER PROGRAM USERS MANUAL
T. G. Keith, Jr., A. A. Afjeh, D. R. Jeng, and J. A. White Apr. 1985 84 p refs
(Grant NCC-3-5; Contract DE-AI01-76ET-20320)
(NASA-CR-174921; NAS 1.26:174921; DOE/NASA/0005-2) Avail: NTIS HC A05/MF A01 CSCL 09B

A description of a computer program entitled VORTEX that may be used to determine the aerodynamic performance of horizontal axis wind turbines is given. The computer code implements a vortex method from finite span wind theory and determines

the induced velocity at the rotor disk by integrating the Biot-Savart law. It is assumed that the trailing helical vortex filaments form a wake of constant diameter (the rigid wake assumption) and travel downstream at the free stream velocity. The program can handle rotors having any number of blades which may be arbitrarily shaped and twisted. Many numerical details associated with the program are presented. A complete listing of the program is provided and all program variables are defined. An example problem illustrating input and output characteristics is solved. Author

N85-33564*# Spire Corp., Bedford, Mass.
BLOCK 5 DOCUMENTATION AND SOLAR MODULES Final Report
28 Feb. 1985 27 p Sponsored by NASA Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176134; JPL-9950-1139; NAS 1.26:176134; DOE/JPL-956334-85/01; DRL-188; DRD-SE-2; FR-60038) Avail: NTIS HC A03/MF A01 CSCL 10B

Design and fabrication of Spire Corporation's Block 5 photovoltaic flat plate module is reviewed. These modules exhibited power of about 70 watts under standard test conditions. Results of performance and environmental testing are provided. Author

N85-33565*# Westinghouse Research and Development Center, Pittsburgh, Pa.
LASER-ASSISTED SOLAR CELL METALLIZATION PROCESSING Quarterly Report, Dec. 1984 - Feb. 1985
A. Rohatgi, S. Gupta, P. G. McMullin, and P. A. Palaschak 4 Apr. 1985 24 p refs Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176124; NAS 1.26:176124) Avail: NTIS HC A02/MF A01 CSCL 10B

Laser-assisted processing techniques for producing high-quality solar cell metallization patterns are being investigated, developed, and characterized. The tasks comprising these investigations are outlined. G.L.C.

N85-33566*# Ohio State Univ., Columbus. Dept. of Welding Engineering.
DIFFUSION WELDING OF CASSEGRAINIAN CONCENTRATOR CELL STACK ASSEMBLIES M.S. Thesis Final Report, Jun. 1983 - Sep. 1985
Kenneth John Gangl Jul. 1985 137 p refs
(Grant NAG3-448)
(NASA-CR-176104; NAS 1.26:176104) Avail: NTIS HC A07/MF A01 CSCL 10B

Development of a procedure to join the components of the Cassegrainian concentrator photovoltaic cell stack assembly was studied. Diffusion welding was selected as the most promising process, and was concentrated on exclusively. All faying surfaces were coated with silver to promote welding. The first phase of the study consisted of developing the relationship between process parameters and joint strength using silver plated steel samples and an isostatic pressure system. In the second phase, mockups of the cell stack assembly were welded in a hot isostatic press. Excellent joint strength was achieved with parameters of 350 C and 10 ksi, but the delicate GaAs component could not survive the welding cycle without cracking. The tendency towards cracking was found to be affected by both temperature and pressure. Further work will be required in the future to solve this problem. Author

N85-33567*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SURFACE VOLTAGE GRADIENT ROLE IN HIGH VOLTAGE SOLAR ARRAY-PLASMA INTERACTION: CENTER DIRECTOR'S DISCRETIONARY FUND Final Report
M. R. Carruth, Jr. Jul. 1985 41 p refs
(NASA-TM-86516; NAS 1.15:86516) Avail: NTIS HC A03/MF A01 CSCL 10A

A large amount of experimental and analytical effort has been directed toward understanding the plasma sheath growth and discharge phenomena which lead to high voltage solar array-space plasma interactions. An important question which has not been addressed is how the surface voltage gradient on such an array may affect these interactions. The results of this study indicate that under certain conditions, the voltage gradient should be taken into account when evaluating the effect on a solar array operating in a plasma environment. Author

N85-33568*# Westinghouse Research and Development Center, Pittsburgh, Pa.
DEVELOPMENT OF HIGH-EFFICIENCY SOLAR CELLS ON SILICON WEB
A. Rohatgi, D. L. Meier, R. B. Campbell, T. W. OKeeffe, and P. Rai-Choudhury 1 Apr. 1985 25 p refs
(Contract JPL-956786; JPL Proj. 9950-1146)
(NASA-CR-176101; NAS 1.26:176101; DRD-SE5; DRL-211; DOE/JPL-956786-85/4) Avail: NTIS HC A02/MF A01 CSCL 10B

It is clear that high efficiency is a major attribute that will enhance the large-scale applicability of photovoltaic systems. Systems calculations indicate that for very large-scale terrestrial applications, > 15% efficient photovoltaic modules will be required at a cost of approx. 50 cents/watt. This implies that approx. 18% efficient cells will be needed at low cost. Dendritic web silicon is a single-crystal silicon ribbon that has great potential for low-cost and high-efficiency solar cells. In this program we are trying to understand the loss mechanisms in dendritic web silicon by investigating the electrical activity of twin planes, the role of impurities and defects in web, impurity interaction with twin planes, starting web material quality, and the effect of heat treatment and gettering on web quality. An improved understanding of the above effects should lead to fabrication of approx. 18% efficient web cells with good uniformity. Progress toward the development of high-efficiency solar cells on web silicon is described. A noval approach to the high-efficiency cell using polysilicon in the emitter region and under the metal grid is reported. Model calculations for resistivity and lifetime considerations for high-efficiency web cells are also shown. G.L.C.

N85-33569*# Purdue Univ., Lafayette, Ind.
INK JET PRINTING OF SILVER METALLIZATION FOR PHOTOVOLTAICS Quarterly Technical Report, 1 Apr. - 30 Jun. 1985
R. W. Vest 22 Jul. 1985 26 p
(Contract JPL-957031)
(NASA-CR-176054; NAS 1.26:176054; DRD-SE-2; DOE/JPL-957031-85/3) Avail: NTIS HC A03/MF A01 CSCL 10B

The development of an ink jet printing system for silver metallization in photovoltaics is discussed. Improvements in line definition, control of surface tension in inks, system memory increases, graphics capabilities, and computer programming relative to computer aided design capabilities are discussed. R.J.F.

N85-33570*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
ULTRASONIC SEAM WELDING ON THIN SILICON SOLAR CELLS Final Report
E. J. Stofel Jun. 1982 84 p Prepared in cooperation with JPL, Pasadena, Calif.
(Contract NAS7-100)
(NASA-CR-176116; JPL-9950-885; NAS 1.26:176116) Avail: NTIS HC A05/MF A01 CSCL 10B

The ultrathin silicon solar cell has progressed to where it is a serious candidate for future light weight or radiation tolerant spacecraft. The ultrasonic method of producing welds was found to be satisfactory. These ultrathin cells could be handled without breakage in a semiautomated welding machine. This is a prototype of a machine capable of production rates sufficiently large to support spacecraft array assembly needs. For comparative purposes, this project also welded a variety of cells with thicknesses up to 0.23 mm as well as the 0.07 mm ultrathin cells. There was no electrical degradation in any cells. The mechanical pull strength of welds on the thick cells was excellent when using a large welding force. The mechanical strength of welds on thin cells

was less since only a small welding force could be used without cracking these cells. Even so, the strength of welds on thin cells appears adequate for array application. The ability of such welds to survive multiyear, near Earth orbit thermal cycles needs to be demonstrated. Author

N85-33571*# Pennsylvania State Univ., University Park.
USE OF LOW ENERGY HYDROGEN ION IMPLANTS IN HIGH EFFICIENCY CRYSTALLINE SILICON SOLAR CELLS Quarterly Report, 1 Jan. - 31 Mar. 1985
S. J. Fonash and Ranbir Singh Mar. 1985 22 p refs Sponsored by NASA Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176109; JPL-9950-1150; NAS 1.26:176109; DOE/JPL-957126-85/01; DRL-223) Avail: NTIS HC A02/MF A01 CSCL 10B

This program is a study of the use of low energy hydrogen ion implantation for high efficiency crystalline silicon solar cells. The first quarterly report focuses on two tasks of this program: (1) an examination of the effects of low energy hydrogen implants on surface recombination speed; and (2) an examination of the effects of hydrogen on silicon regrowth and diffusion in silicon. The first part of the project focussed on the measurement of surface properties of hydrogen implanted silicon. Low energy hydrogen ions when bombarded on the silicon surface will create structural damage at the surface, deactivate dopants and introduce recombination centers. At the same time the electrically active centers such as dangling bonds will be passivated by these hydrogen ions. Thus hydrogen is expected to alter properties such as the surface recombination velocity, dopant profiles on the emitter, etc. In this report the surface recombination velocity of a hydrogen emplanted emitter was measured. B.W.

N85-33572# Solarex Corp., Rockville, Md.
AN ENHANCED PHOTORESPONSE AT DISLOCATION SUBGRAIN BOUNDARIES REVEALED BY X-RAY TOPOGRAPHY OF POLYSILICON SOLAR CELLS
S. M. Johnson, R. W. Armstrong (Maryland Univ., College Park), R. C. Rosemeier (Maryland Univ., College Park), G. M. Storti, H. C. Lin (Maryland Univ., College Park), and W. F. Regnault (Semix, Inc., Gaithersburg, Md.) 1985 6 p refs
(Contract DE-FC01-80ET-23197)
Avail: NTIS HC A02/MF A01

An enhanced photoresponse at dislocation subgrain boundaries (in comparison with grain boundaries and dislocation associated twin boundaries) is attributed to an increased junction depth at their positions relative to the value of the minority carrier diffusion length. For reasonably pure material, minority carrier diffusion length is determined by the dislocation density. The dislocation microstructure of polysilicon solar cells is advantageously studied by means of the several X-ray topography techniques. Author

N85-33573# Semix, Inc., Gaithersburg, Md.
INVESTIGATION OF THE MICROSTRUCTURE AND PHOTOVOLTAIC PROPERTIES OF SEMICRYSTALLINE SILICON
W. F. Regnault, K.-C. Yoo (Maryland Univ., College Park), S. M. Johnson (Solarex Corp., Rockville, Md.), G. Breidenthal, R. G. Rosemeier (Maryland Univ., College Park), C. D. Wang (Maryland Univ., College Park), R. W. Armstrong (Maryland Univ., College Park), and H. C. Lin (Maryland Univ., College Park) 1985 12 p refs
Avail: NTIS HC A02/MF A01

To better understand the origins of inclusions and other microstructural defects, and thus control their effect on solar cell performance, the interaction of the defect structure with the photovoltaic properties of ubiquitous crystallization process (UCP) material is reported. Results are presented that show that the dislocation network expand as the solidification process continues. A comparison of the dislocation content determined by both topographical and chemical means are made and variations in the photovoltaic properties in the material are shown. The development and progression of a dislocation subgrain structure through a limited section of a UCP ingot is investigated and discussed. Also, the photovoltaic properties associated with this defect structure are compared to those obtained in a more typical low dislocation region. Author

N85-33574# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
SAFETY CHARACTERISTICS OF NON-LITHIUM BATTERY SYSTEMS Final Report, period ending 1984
R. M. Murphy (Advanced Battery Group, Lancaster, N.Y.) and R. F. Bis Jul. 1984 324 p
(Contract N60921-84-C-0027)
(AD-A155733; NSWC-TR-84-302) Avail: NTIS HC A14/MF A01 CSCL 10/3

A study was conducted to determine the safety characteristics for both primary and secondary nonlithium battery systems. Of particular interest was the behavior of these battery systems when subjected to the electrical and thermal abuse testing procedures of NAVSEAINST 9310.1A (i.e., short circuit, forced overdischarge, and incineration). Also included are the safety/hazard characteristics associated with charging primary batteries and overcharging secondary batteries. This report also summarizes the manufacture, electrical performance, failure mechanisms, self-discharge, and applications for 22 primary and 19 secondary battery systems. GRA

N85-33575# Department of the Army, Washington, D. C.
RECHARGEABLE LITHIUM-ORGANIC ELECTROLYTE BATTERY HAVING OVERCHARGE PROTECTION AND METHOD OF PROVIDING OVERCHARGE PROTECTION FOR A LITHIUM-ORGANIC ELECTROLYTE BATTERY Patent Application
W. K. Behl, inventor (to Army) Filed 13 Jun. 1985 7 p
(AD-D011738; US-Patent-Appl-SN-744344) Avail: NTIS HC A02/MF A01 CSCL 10/3

The general object of this invention is to provide overcharge protection for rechargeable lithium-organic electrolyte batteries. A further object is to prevent the undesirable oxidation of organic solvents during the overcharge of the rechargeable lithium-organic electrolyte batteries. It has now been found that the aforementioned objects can be attained by including lithium bromide in the electrolyte to provide overcharge protection during the overcharging of rechargeable lithium-organic electrolyte cells. More particularly, it has been found that during overcharging, lithium bromide will be oxidized at lower potentials than the organic solvent and thereby provide overcharge protection and prevent the undesirable oxidation of organic solvents. GRA

N85-33576# Department of Energy, Washington, D. C.
STABLE n-CuInSe/SUB 2/IODIDE-IODINE PHOTOELECTROCHEMICAL CELL Patent Application
D. Cahen (Midwest Research Inst., Golden, Colo.) and Y. W. Chen, inventors (to DOE) (Midwest Research Inst., Golden, Colo.) Filed 20 Sep. 1984 16 p
(Contract DE-AC02-83CH-10093)
(DE85-011597; US-Patent-Appl-SN-652396) Avail: NTIS HC A02/MF A01 CSCL 10B

In a photoelectrochemical solar cell, stable output and solar efficiency in excess of 10% are achieved with a photoanode of n-CuInSe2 electrode material and an iodine/iodide redox couple used in a liquid electrolyte. The photoanode is prepared by treating the electrode material by chemical etching, for example in Br2/MeOH; heating the etched electrode material in air or oxygen; depositing a surface film coating of indium on the electrode material after the initial heating; and thereafter again heating the electrode material in air or oxygen to oxidize the indium. The electrolyte is treated by the addition of Cu(+) or Cu(2+) salts and in In(3+) salts. DOE

N85-33577# Department of Energy, Washington, D. C.
MOLTEN CARBONATE FUEL CELL SEPARATOR Patent Application
R. C. Nickols, inventor (to DOE) (United Technologies Corp., South Windsor, Conn.) Filed 17 Oct. 1984 24 p
(Contract DE-AC21-79ET-15440)
(DE85-011615; US-Patent-Appl-SN-661850) Avail: NTIS

HC A02/MF A01 CSCL 10B

In a stacked array of molten carbonate fuel cells, a fuel cell separator is positioned between adjacent fuel cells to provide isolation as well as a conductive path therebetween. The center portion of the fuel cell separator includes a generally rectangular, flat, electrical conductor. Around the periphery of the flat portion of the separator are positioned a plurality of elongated resilient flanges which form a gas tight seal around the edges of the fuel cell. With one elongated flange resiliently engaging a respective edge of the center portion of the separator, the sealing flanges, which are preferably comprised of a noncorrosive material such as an alloy of yttrium, iron, aluminum or chromium, form a tight fitting wet seal for confining the corrosive elements of the fuel cell therein. This arrangement permits a good conductive material which may be highly subject to corrosion and dissolution to be used in combination with a corrosion resistant material in the fuel cell separator of a molten carbonate fuel cell for improved fuel cell conductivity and a gas tight wet seal. DOE

N85-33578# Department of Energy, Washington, D. C.
ELECTROLYTIC CELL Patent Application
J. S. Bullock (ORNL, Tenn.) and B. D. Hale, inventors (to DOE) (ORNL, Tenn.) Filed 14 Sep. 1984 14 p
(Contract DE-AC05-84OR-21400)
(DE85-011598; US-Patent-Appl-SN-652690) Avail: NTIS HC A02/MF A01 CSCL 10B

An apparatus is described for the separation of the anolyte and the catholyte during electrolysis. The electrolyte flows through an electrolytic cell between the oppositely charged electrodes. The cell is equipped with a wedge-shaped device, the tapered end is located between the electrodes on the effluent side of the cell. The wedge diverts the flow of the electrolyte to either side of the wedge, substantially separating the anolyte and the catholyte. DOE

N85-33579# Houston Univ., Tex. Energy Lab.
THEORY OF CELLWISE OPTIMIZATION FOR SOLAR CENTRAL RECEIVER SYSTEM
F. W. Lipps May 1985 80 p
(Contract DE-AC04-76DR-00789)
(DE85-012586; SAND-85-8177) Avail: NTIS HC A05/MF A01

Cost effective optimization of the solar central receiver system is primarily concerned with the distribution of heliostats in the collector field, including the boundaries of the field. The cellwise optimization procedure determines the optimum cell usage and heliostat spacing parameters for each cell in the collector field. Spacing parameters determine the heliostat density and neighborhood structure uniformly in each cell. Consequently, the cellwise approach ignores heliostat mismatch at cell boundaries. Ignoring the cell boundary problem permits an easy solution for the optimum in terms of appropriately defined annual average data. Insolation, receiver interception, shading and blocking, cosine effects, and the cost parameters combine to control the optimum. Many trade offs are represented. Outputs include the receiver flux density distribution for design time, coefficients for an actual layout, the optimum boundary and various performance and cost estimates for the optimum field. It is also possible to optimize receiver size and tower height by a repeated application of the field optimization procedure. DOE

N85-33580# Columbia Univ., New York. School of Mines.
DEFECT INTERACTIONS AT HIGH CONCENTRATIONS IN SOLID OXIDE ELECTROLYTES Final Report, 1 Jan. 1978 - 31 Jan. 1985
A. S. Nowick 1985 16 p
(Contract DE-AC02-78ER-04693)
(DE85-011824; DOE/ER-04693/24) Avail: NTIS HC A02/MF A01

The principal aim was to obtain a better understanding of the nature of point defects and their interactions in the class of solid oxide electrolytes that possess the fluorite structure. These electrolytes are oxygen-ion conductors which are of considerable interest for applications to high temperature fuel cells as well as for use as oxygen probes and for thermodynamic measurements. The major work has been on CeO2, which turned out to be an excellent prototype of this class of oxides. Here ionic conduction takes place through the migration of oxygen-ion vacancies (VO) that are present as charge compensation for lower valent (M(2+) or M(3+) dopant cations. This work concentrated on trivalent dopant ions. Initially Y(3+) was most extensively studied, but later different dopant ions of varying radii (e.g., La(3+), Gd(3+) and Sc(3+)) were introduced. The principal techniques brought to hear on these problems include, in addition to ionic conductivity measurement, the study of dielectric and anelastic relaxation. Two ranges of behavior were studied: a dilute range (less than or equal to 1 mole % dopant) and a concentrated range. DOE

N85-33581# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
PHOTOVOLTAIC ENERGY SYSTEMS Program Summary, 1984
Apr. 1985 373 p
(Contract DE-AC02-83CH-10093)
(DE85-011630; DOE/CE-0033/3) Avail: NTIS HC A16/MF A01

An overview is provided of the government funded activities within the National photovoltaics Program. Tasks conducted in house by the participating national laboratories or under contract by industrial, academic and other research institutions are highlighted. Those activities initiated, renewed, or completed during Fiscal Year 1984 are covered. The summary for each contract provides the title, contractor, directing organization, principal investigator, project engineer, contract number, current contract period, funding, objectives, approach, status, and a list of major project reports. DOE

N85-33582# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
1985 AMORPHOUS SILICON REVIEW MEETING
Mar. 1985 322 p refs Meeting held in Washington, D.C., 21-23 Mar. 1985
(Contract DE-AC02-83CH-10093)
(DE85-008794; SERI/CP-211-2682; CONF-8503106) Avail: NTIS HC A14/MF A01

Separate abstracts were prepared for 32 papers in this meeting proceedings. One other paper had been previously abstracted for EDB. DOE

N85-33583# City of Pagosa Springs, Colo.
PAGOSA SPRINGS GEOTHERMAL PROJECT Final Technical Report
19 Oct. 1984 15 p refs
(DE-FG48-81R8-01066)
(DE85-011308; DOE/R8-01066/T2) Avail: NTIS HC A02/MF A01

Some ideas and methods for using Colorado geothermal energy are discussed. A project installed in Pagosa Springs, which consists of a pipeline laid down 8th street with service to residences retrofitted to geothermal space heating, is described. DOE

N85-33584# Varian Associates, Palo Alto, Calif. Solid State Lab.
LOW-COST HIGH-PERFORMANCE SILICON CONCENTRATOR CELLS
P. G. Borden Feb. 1985 73 p
(Contract DE-AC04-76DP-00789)
(DE85-008875; SAND-84-7005) Avail: NTIS HC A04/MF A01

Silicon solar cells have not performed well at high concentrations because of excess emitter and base resistance. The V groove, or VG silicon solar cell has a novel emitter structure that allows use of wide, closely spaced front contact grid lines without significant obscuration, eliminating emitter resistance almost entirely. The active layers can be relatively thin because rays refract obliquely at the cell front, making it possible to reduce significantly both emitter and base resistance and improve high concentration performance. Efficiencies over 19% at 100 suns and 20(0)C have been obtained with a cell area of .5 x .5 cm.

This cell has about 33% of the front surface covered with metal, with a V groove period of 50 microns and grid line spacing of 83 microns. The cell has a single layer antireflection coating of silicon nitride. This performance approaches state of the art for silicon concentrator cells and demonstrates the principle of the VG cell. The drop in efficiency at higher concentration, due probably to base resistance, can be overcome by using thinner active layers. DOE

N85-33585# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

PHOTOVOLTAICS TECHNICAL INFORMATION GUIDE

Noni Strawn, ed. Feb. 1985 150 p

(Contract DE-AC02-83CH-10093)

(DE85-002924; SERI/SP-271-2452) Avail: NTIS HC A07/MF A01

Background on the history and current technical status of photovoltaics is provided, covering such topics as cell theory and designs, cell materials, photovoltaic modules and arrays, balance of systems, applications, performance and reliability, economics, and other issues. This is followed by a catalog of current research centers, information sources and design tools. DOE

N85-33586# Institute of Gas Technology, Chicago, Ill.

EFFECTS OF H2S ON MOLTEN CARBONATE FUEL CELLS. LITERATURE REVIEW ON THE IMPACT OF SO2 IN THE OXIDANT SUPPLIED TO MOLTEN CARBONATE FUEL CELLS

R. J. Remick May 1985 29 p refs

(Contract DE-AC21-83MC-20212)

(DE85-011698; DOE/MC-20212/1808) Avail: NTIS HC A03/MF A01

The purpose is to identify available information regarding the impact upon fuel cell performance of sulfur dioxide at ppM levels in oxidant gases supplied to molten carbonate fuel cells (MCFC). The general conclusions are as follows: (1) the major source of sulfur dioxide in the oxidant is oxidized sulfur species coming from the fuel; (2) sulfur dioxide in the oxidant can react with oxygen and carbonate to produce sulfate in the electrolyte; (3) sulfate in the electrolyte is Faradaically transported to the anode where it is reduced to hydrogen sulfide; (4) the major and thus far only identifiable mechanism for performance loss in MCFC is caused by this hydrogen sulfide forming nickel sulfide on the anode; and (5) there are a number of other chemical reactions in which sulfur dioxide may participate which have not been investigated. Included in this group are the oxidation to sulfur trioxide and the corrosion of nickel and nickel oxide. DOE

N85-33587# California Univ., Berkeley. Lawrence Berkeley Lab.

ENTHALPY TRANSIENTS IN FRACTURED TWO-PHASE GEOTHERMAL SYSTEMS

M. J. Lippmann, G. S. Bodvarsson, and S. W. Gaulke Mar. 1985 10 p refs Presented at the Intern. Symp. on Geothermal Energy, Kailua Kona, Hawaii, 26 Aug. 1985

(Contract DE-AC03-76SF-00098)

(DE85-011988; LBL-19365; CONF-850801-34) Avail: NTIS HC A02/MF A01

Numerical modeling techniques are used to study the changes in flowing enthalpy of fluids produced from a well completed in a fractured two-phase geothermal reservoir. Complex interactions between different fracture and porous matrix parameters control the enthalpy transients. The results show that the flowing enthalpy is most sensitive to the characteristics of the relative permeability curves, the magnitude of the matrix permeability and the effective fracture porosity. Other parameters such as the thermal conductivity and fracture spacing also significantly affect the flowing enthalpy. In spite of the complex phenomena associated with enthalpy transients in fractured two-phase systems, it is possible to infer useful information about the producing geothermal reservoirs from field data. DOE

N85-33588# Argonne National Lab., Ill.

TRANSFER OF BATTERY TECHNOLOGY DEVELOPED BY THE US DEPARTMENT OF ENERGY

W. J. Walsh and P. C. Symons Aug. 1984 57 p

(Contract W-31-109-eng-38)

(DE85-009868; ANL/SPG-25) Avail: NTIS HC A04/MF A01

This study examines linkages between government and the private sector in battery research and development, investigates industry's use of advances in battery technology developed with funding from the US Department of Energy (DOE), and explores the appropriate federal role. A major finding is that industry can promptly and effectively translate battery advances with commercial potential into new products, and that aggressive technology transfer activities by DOE are unnecessary. Major US battery companies were found to be highly knowledgeable with respect to DOE program content and technological advances attained. In addition, liberal patent waivers have allowed companies to build proprietary positions, and technology diffusion within the private sector can be rapid and efficient. It appears that DOE can best increase the transfer of technology to industry by simply creating advances with commercial potential at a faster rate. Principal recommendations include: (1) an expanded advisory role for industry; (2) increased programmatic flexibility; (3) greater efforts aimed at quantum advances; and (4) increased technical autonomy for industrial contractors. Author

N85-33589# Morrison-Knudsen Engineers, Inc., San Francisco, Calif.

SMALL-HYDROPOWER DEVELOPMENT: THE PROCESS, PITFALLS, AND EXPERIENCE. VOLUME 1: FEASIBILITY STUDIES SUMMARY AND ANALYSIS Interim Report

C. H. Cunningham, J. P. Christensen, and A. R. Engebretsen Apr. 1985 655 p Sponsored in part by EPRI

(Contract DE-AC07-82ID-12254; EPRI Proj. 1745-15)

(DE85-010839; EPRI-EM-4036-Vol-1) Avail: NTIS HC A99/MF A01; also available from Research Reports Center, Box 50490, Palo Alto, Calif. 94303

An investigation of 240 feasibility studies of small hydropower projects conducted under the National Small Hydropower Program is summarized. It provides a detailed analysis of these studies, both to better understand the significance of the information contained therein, and to present this information in a clear, consistent, and comprehensive manner, for the benefit of future developers of small hydropower projects. With the assistance of a commercially available computer program, the analysis extracted significant data contained in the feasibility studies, and sorted this information into separate categories. These data were then analyzed, and summarized both for each individual project and for the overall program. Findings in the report identify significant relationships among several of the major information categories pertaining to the feasibility of certain types of projects. Categories considered included geographic region, gross head, capacity, and capital costs. DOE

N85-33590# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

ADVANCES IN OPEN-CYCLE SOLID DESICCANT COOLING

Terry R. Penney and Ian Maclaine-Cross May 1985 16 p refs Presented at Solar Buildings: Realities for Today - Trends for Tomorrow, Washington, D.C., 18-20 Mar. 1985

(Contract DE-AC02-83CH-10093)

(DE85-008797; SERI/TP-252-2683; CONF-850388-9) Avail: NTIS HC A02/MF A01

Of the solar cooling options available open cycle solid desiccant cooling looks very promising. A brief review of the experimental and analytical efforts to date shows that within the last 10 years thermal performance has doubled. Research centers have been developed to explore new materials and geometry options and to improve and validate mathematical models that can be used by design engineers to develop new product lines. Typical results from the Solar Energy Research Institute's (SERI) Desiccant Cooling Research Program are shown. Innovative ideas for new cycles and spinoff benefits provide incentives to continue research in this promising field. DOE

N85-33591# Bonneville Power Administration, Portland, Oreg.
PACIFIC NORTHWEST AND ALASKA BIOENERGY PROGRAM GLOSSARY
Feb. 1985 6 p Sponsored in part by DOE
(DE85-011740; DOE/BP-395) Avail: NTIS HC A02/MF A01

A glossary of terms for the bioenergy program of the Pacific Northwest and Alaska is presented. A table with physical constants for individual gases most frequently found in fuel gases is also presented in this publication. DOE

N85-33592# Los Alamos National Lab., N. Mex.
FUEL CELL APPLICATIONS LITERATURE REVIEW
D. H. Nochumson, J. H. Altseimer, K. D. Williamson, Jr., J. A. Frank, A. T. Peaslee, A. J. Martinez, and C. A. Stroup Mar. 1985 145 p refs
(Contract W-7405-eng-36)
(DE85-011891; LA-10323-MS) Avail: NTIS HC A07/MF A01

The fuel cell applications literature is reviewed and evaluated. The purpose is to identify those applications that show promise. Over 40 computerized data bases were queried, and over 4000 abstracts were screened, resulting in the selection of over 600 pertinent documents that were entered into a fuel cell applications computerized data base. These documents were reviewed and evaluated. Fuel cells will need to be manufactured at low cost in order to compete against internal combustion engines for land transportation applications. Further study is recommended to evaluate fuel cell use in both fixed applications (industrial, institutional, and military) and mobile applications (marine, aircraft, space, and military land transportation). In addition to the recommendations of this report, a computerized data base of literature covering fuel cell uses and applications has been established and is available for use. DOE

N85-33593# Aerospace Corp., El Segundo, Calif. Energy and Resources Div.
SOLAR CENTRAL RECEIVER PRELIMINARY DESIGN STUDIES: SUMMARY AND REVIEW OF CONTRACT RESULTS
P. K. Munjal 1 Apr. 1985 113 p
(Contract DE-AI03-81SF-11578)
(DE85-011385; ATR-85(5836)-IND) Avail: NTIS HC A06/MF A01

Four different site-specific solar central receiver (SCR) system designs were developed, on a cost-shared basis, by four industrial design teams. The results of the four preliminary design studies are summarized and reviewed. Observations as to the accuracy and system level importance of the data are made. Comparisons are made of the designs, performance of the subsystems and the overall plants, capital and projected costs, operating and maintenance costs, solar plant revenues, and different tax benefits. DOE

N85-33594# Sandia Labs., Livermore, Calif.
STUDY OF ALTERNATIVE SYSTEM CONVERSIONS FOR THE SOLAR ONE PILOT PLANT
Mar. 1985 63 p
(Contract DE-AC04-76DR-00789)
(DE85-010026; SAND-85-8212) Avail: NTIS HC A04/MF A01

The study of options for the conversion of Solar One to an advanced molten salt or liquid sodium central receiver system is described. Six options were considered for the system conversion of Solar One. Five of the options are solar stand-alone plants that add combinations of the following equipment, molten salt or liquid sodium receiver, thermal storage, and steam generator, and upgrading of the existing heliostats or the addition of advanced heliostats. The sixth option combines a molten salt receiver, molten salt storage, and steam generator with a fossil fueled energy source to provide data for hybrid (solar/fossil) operation. The results of this study indicate that several conversion options exist which will reduce the technical and economic risks associated with advanced central receiver systems. The costs of the options are not significantly different, and a comparison of the options did not identify a clear technical choice as to the best alternative. Electrical utility preferences should play a strong role in selecting the conversion option. DOE

N85-33595# Brown and Root, Inc., Houston, Tex.
LOW-HEAD HYDROELECTRIC POWER DEMONSTRATION PROJECT: CITY OF GONZALES, TEXAS Final Technical and Construction Cost Report
Jan. 1985 76 p
(Contract DE-FC07-80ED-12121)
(DE85-010403; DOE/ID-12121/T2) Avail: NTIS HC A05/MF A01

This report summarizes the project construction which began in the second quarter of 1980 with the dismantling of the existing turbines, and was completed in the last quarter of 1983. The existing power plant structure and dam are located at Gonzales, Texas on the Guadalupe River. The powerhouse was built in 1925. The ungated dam produces a net head of about 14 feet. The power plant consists of three bays that originally housed three vertical open flume units. Power was transmitted from each turbine runner by a vertical shaft to a generator located some 20 feet above the crest of the dam and above normal river flood levels. The plant went into operation soon after 1925. Each unit had a nominal output of about 370 kW. In 1965, the generator, governors, and electrical equipment were removed from the powerhouse. The turbines were left in place. The dam and powerhouse were in fairly good condition, requiring only minimal restoration. However, bank protection on the left abutment and erosion control improvements on the right abutment were necessary. Disassembly and inspection of the old turbines showed them to be in good condition, and the decision was made to rehabilitate them. DOE

N85-33596# Pacific Northwest Lab., Richland, Wash.
PHOTOVOLTAIC INDUSTRY PROGRESS THROUGH 1984
R. L. Watts, S. A. Smith, and J. A. Dirks Apr. 1985 102 p
(Contract DE-AC06-76RL-01830)
(DE85-013029; PNL-5483) Avail: NTIS HC A06/MF A01

The growth of the US photovoltaics (PV) industry over the past decade has been impressive. First designed to provide power for satellites using high-cost production techniques, PV is now the economical choice in many remote terrestrial applications. The remarkable growth of PV in terms of quality of cells and modules, production techniques, and system design, was initiated by a cooperative effort of the US Government and the domestic PV manufacturers. European and Japanese firms entered the PV industry later, but are also growing rapidly. The Europeans continue to supply PV systems for village electrification and water pumping to many Third World countries. The Japanese have been developing the amorphous silicon (A-Si) technology by expanding its use in consumer goods. The objective of this report is to present information on the developments of the world PV industry and focuses on developments occurring in 1984. Information is presented on a regional basis (US, Europe, Japan, other) to avoid disclosing company-confidential data. All information was gleaned from several sources, including a review of the technical literature and direct contacts with PV manufacturers. Prior to publishing the regional totals, all numbers were compared with those of other sources. DOE

N85-33597# Pacific Northwest Lab., Richland, Wash.
LONG-TERM GOALS FOR SOLAR THERMAL TECHNOLOGY
T. A. Williams, J. A. Dirks, and D. R. Brown May 1985 107 p refs
(Contract DE-AC06-76RL-01830)
(DE85-013032; PNL-5463) Avail: NTIS HC A06/MF A01

Long-term performance and cost goals for three solar thermal technologies are discussed. Pacific Northwest Laboratory (PNL) developed these goals in support of the Draft Five Year Research and Development Plan for the National Solar Thermal Technology Program (DOE 1984b). These technology goals are intended to provide targets that, if met, will lead to the widespread use of solar thermal technologies in the marketplace. Goals were developed for three technologies and two applications: central receiver and dish technologies for utility-generated electricity applications, and central receiver, dish, and trough technologies for industrial process heat applications. These technologies and applications were chosen because they are the primary technolo-

gies and applications that have been researched by DOE in the past. System goals were developed through analysis of future price projections for energy sources competing with solar thermal in the middle-to-late 1990's time frame. The system goals selected were levelized energy costs of 0.05/kWh for electricity and $9/MBtu for industrial process heat (1984 $). Component goals established to meet system goals were developed based upon projections of solar thermal component performance and cost which could be achieved in the same time frame. DOE

N85-33598# California Univ., Berkeley. Lawrence Berkeley Lab.
TECHNOLOGY TRANSFER REPORT: FEASIBILITY STUDY FOR THE USE OF GEOTHERMAL BRINE IN THE ASHDOD AREA, ISRAEL
S. M. Benson Aug. 1984 41 p refs
(Contract DE-AC03-76SF-00098)
(DE85-013316; LBL-18520) Avail: NTIS HC A03/MF A01

The hydrothermal potential of the Ashdod area, Israel, was evaluated to determine its suitability as the low grade energy source required to operate the Ashdod desalination plant. An estimated 1250 cubic meters per hour of 120 C brine would be adequate to supply the hot water necessary for operating the desalination plant. Considerable interest in oil exploration in the Ashdod area resulted in the drilling of six wells into the Jurassic formations by Oil Exploration (Investments) Ltd. (OEL) in 1976 to 1980. A small amount of oil was found in two wells, Ashdod 2 and 5. The remaining wells were abandoned as dry holes. Evaluation of the drill cuttings, cores, and the electric logs defined two lithologic units of potential interest for hydrothermal exploitation, the Zohar and Shderot Dolomites. Investigation of the hydrothermal potential of the Jurassic formations underlying the Ashdod area has revealed that the aquifer temperatures range between 85 and 92 C. The hydrologic parameters are not well defined; however, the matrix permeability of the dolomites and limestones is probably between 1 and 10 md. This is insufficient permeability for a large scale pumping operation such as the one required to operate the desalination plant. DOE

N85-33599# Department of Energy, Washington, D. C.
METHOD AND APPARATUS FOR MEASURING AREAS OF PHOTOELECTRIC CELLS AND PHOTOELECTRIC CELL PERFORMANCE PARAMETERS Patent Application
C. R. Osterwald (Midwest Research Agency, Golden, Colo.) and K. A. Emery, inventors (to DOE) (Midwest Research Agency, Golden, Colo.) Filed 29 May 1984 22 p refs
(DE85-011629; US-Patent-Appl-SN-614506) Avail: NTIS HC A02/MF A01

A laser scanning system for scanning the surface of photovoltaic cell in a precise, stepped raster pattern includes electric current detecting and measuring equipment for sensing the current response of the scanned cell to the laser beam at each stepped irradiated spot or pixel on the cell surface. A computer is used to control and monitor the raster position of the laser scan as well as monitoring the corresponding current responses, storing this data, operating on it, and for feeding the data to a graphical plotter for producing a visual, color coded image of the current response of the cell to the laser scan. A translation platform driven by stepper motors in precise X and Y distances holds and rasters the cell being scanned under a stationary spot focused laser beam. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-33600 Defence Research Information Centre, Orpington (England).
CHEMORECEPTION AND DETECTION OF MICROPOLLUTANTS BY MEANS OF A TELEMETRIC BIONIC DETECTOR
J. L. Huve Feb. 1985 22 p refs Transl. into ENGLISH from Oceanis (France), vol. 10, 1984 p 191-204
(DRIC-T-7460; BR94715) Copyright. Avail: NTIS HC A03/MF A01

The feasibility of using rainbow trout as a biological detector for micropollutants in freshwater ecosystems was studied. Experiments used the electrical activity of the olfactory bulb of the trout to detect micropollutants. An FM transmitter coupled to two electrodes implanted in the bulb of the fish is used to send signals to a computer. The experiments were carried out with groups of pesticides, herbicides, polychlorobiphenyl and organo mineral molecules. Results suggest that the system can act as a real time alarm, but requires development to act as an analytical indicator of micropollution. Author (ESA)

N85-33601# Committee on Energy and Commerce (U. S. House).
ACID RAIN IN EUROPE
Washington GPO 1985 101 p Rept. presented by the Subcomm. on Health and the Environ. of the Comm. on Energy and Com., 99th Congr., 1st Sess., Mar. 1985
(Committee-Print-99-F; GPO-43-653) Avail: Subcommittee on Health and the Environment

The effects of acid rain and air pollution in Europe are discussed. Damage to forests and buildings is described. Efforts to reduce emissions are reviewed. R.J.F.

N85-33602# Westinghouse Electric Corp., West Mifflin, Pa.
THE 1984 EFFLUENT AND ENVIRONMENTAL MONITORING REPORT FOR THE BETTIS ATOMIC POWER LABORATORY
1985 43 p
(Contract DE-AC11-76PN-00014)
(DE85-011533; DOE/PN-0014/T1; WAPD-RC/E(HE)-2134) Avail: NTIS HC A03/MF A01

The results of the radiological and non-radiological environmental monitoring programs for 1984 at the Bettis Laboratory are presented. The results obtained from the monitoring programs demonstrate that the existing procedures ensure that all environmental releases during 1984 were in accordance with applicable state and federal regulations. Evaluation of the environmental data indicates that operation of the Laboratory continued to have no adverse effect on the quality of the environment. Furthermore, a conservative assessment of radiation exposure to the general public as a result of Laboratory operations demonstrated that the dose received by any member of the public was well below the most restrictive dose limits prescribed by the Environmental Protection Agency and the Department of Energy. DOE

N85-33603# California Univ., Livermore. Lawrence Livermore Lab.
ARAC STATUS REPORT, 1985
M. H. Dickerson, P. H. Gudiksen, T. J. Sullivan, and G. D. Greenly May 1985 20 p
(Contract W-7405-eng-48)
(DE85-012835; UCRL-53641) Avail: NTIS HC A02/MF A01

The atmospheric release advisory capability (ARAC) is a real time emergency response service available to federal and state agencies for providing estimates of the environmental consequences of accidental releases of radioactivity into the atmosphere. This includes the estimation of radiation doses to nearby population centers and the levels and extent of surface contamination. The service is currently being expanded to support the emergency response plans at approximately 50 Department of Defense and Department of Energy facilities. This expansion consists of the installation of enhanced computational and data communications and processing systems, development of terrain and geographic data bases, improvements in modeling capabilities, as well as increased staff housing facilities. The current status of ARAC and the requirements to receive the service are summarized. DOE

N85-33604# Allied Bendix Aerospace, Kansas City, Mo.
ENVIRONMENTAL SUMMARY FOR CALENDAR YEAR 1984
Apr. 1985 48 p
(Contract DE-AC04-76DP-00613)
(DE85-012020; BDX-613-3244) Avail: NTIS HC A03/MF A01

Environmental monitoring for significant non-radioactive pollutants was conducted. Monitoring for radioactive pollutants was not conducted because no processes exist that have a radioactive effluent to the environment. Ambient air and surface water analyses have shown no discernible effects on the environment from plant discharges. However, on-site ground water analyses initially conducted in CY1984 continued to detect the presence of chlorinated solvents. A site characterization study in conjunction with a DOE-wide environmental assessment program was initiated in CY1984 and will further clarify this situation as well as identify other areas of environmental concerns. The plant's National Pollutant Discharge Elimination System permit required effluent monitoring or discharges entering Indian Creek and Blue River. Abatement activity and discharge monitoring reports have been routinely submitted. Requirements for reporting subject to the Federal Metal Finishing regulations were met in CY1984. In accordance with the technical requirements of the EPA regulations implementing the Resource Conservation and Recovery Act, hazardous waste disposal activities are reported to the EPA and the state of Missouri. DOE

N85-33605# Los Alamos National Lab., N. Mex.
ENVIRONMENTAL SURVEILLANCE AT LOS ALAMOS DURING 1984
Apr. 1985 207 p refs
(Contract W-7405-eng-36)
(DE85-011886; LA-10421-ENV) Avail: NTIS HC A10/MF A01

This report describes the environmental surveillance program conducted by the Los Alamos National Laboratory during 1984. Routine monitoring for radiation and radioactive or chemical substances is conducted on the Laboratory site and in the surrounding region to determine compliance with appropriate standards and permit early identification of possible undesirable trends. Results and interpretation of data for 1984 are included on external penetrating radiation; on the chemical and radiochemical quality of ambient air, surface and ground waters, municipal water supply, soils and sediments, and foodstuffs; and on the quantities of airborne emissions and liquid effluents. Comparisons with appropriate standards, regulations, and background levels from natural or other non-Laboratory sources provide a basis for concluding that environmental effects attributable to Laboratory operations are insignificant and are not considered hazardous to the population of the area or Laboratory employees. DOE

N85-33606# California Univ., Livermore. Lawrence Livermore Lab.
ENVIRONMENTAL MONITORING AT LAWRENCE LIVERMORE NATIONAL LABORATORY: 1984 REPORT Annual Report, 1984
K. S. Griggs, D. S. Myers, and R. W. Buddemeier Feb. 1985 90 p refs
(Contract W-7405-eng-48)
(DE85-011593; UCRL-50027-84) Avail: NTIS HC A05/MF A01

A strict effluent-control program that emphasizes controlling effluents at the source has been in effect since the Lawrence Livermore National Laboratory (LLNL) began operation. The Environmental Monitoring program evaluates the effectiveness of these measures, documents whether effluents from LLNL and Site 300 operations are within applicable standards, and estimates the impact of these operations on the environment. Sensitive monitoring equipment is used that can detect radioactive and nonradioactive pollutants at environmental background levels. The program includes the collection and analysis of air, soil, water, sewer effluent, vegetation, foodstuffs, and milk samples. Also, environmental background radiation is measured at numerous locations in the vicinity of LLNL using gamma and neutron dosimeters. The results of the 1984 program are summarized. DOE

N85-33607# Sandia Labs., Albuquerque, N. Mex.
THE 1984 ENVIRONMENTAL MONITORING REPORT, SANDIA NATIONAL LABORATORIES, ALBUQUERQUE, NEW MEXICO
G. C. Millard, C. E. Gray, and D. J. Thompson Apr. 1985 32 p refs
(Contract DE-AC04-76DP-00789)
(DE85-011175; SAND-85-0550) Avail: NTIS HC A03/MF A01

Fallout levels of (137)Cs were detected in vegetation. Values ranged from less than minimal detectable limit (MDL) to 0.295 pCi/g. Only background was detected off-site. Soil concentrations for (137)Cs ranged from 0.052 to 0.732 pCi/g. Total uranium concentrations in soil ranged from 2.0 to 3.9 (MU)g/g. Concentrations of (3)H and (137)Cs in regional surface and well waters were at or near MDL. Dross alpha concentrations in well waters ranged from 0.0029 to 0.0093 pCi/ml. Gross beta concentrations were all at or near MDL in well waters. Gross alpha concentrations in surface water ranged from MDL to 0.0031 pCi/ml. Gross beta concentrations in surface water ranged from less than MDL to 0.0214 pCi/ml. Uranium concentrations ranged from 0.0015 to 0.0059 (MU)g/ml in water samples. External penetrating radiation doses for the Albuquerque community area averaged 110 mrem/y. This is the natural background dose rate for the region attributable to terrestrial and cosmic radiation. The calculated site boundary concentrations for gaseous radionuclides are less than 0.001% of applicable radiation protection guides. These concentrations cannot readily be measured. The estimated population dose due to the release of gaseous radionuclides from SNL was 0.153 person-rem over the 80-km-radius Albuquerque area. DOE

N85-33608# Pacific Northwest Lab., Richland, Wash.
MELSAR: A MESOSCALE AIR QUALITY MODEL FOR COMPLEX TERRAIN. VOLUME 1: OVERVIEW, TECHNICAL DESCRIPTION AND USER'S GUIDE
K. J. Allwine and C. D. Whiteman Apr. 1985 155 p refs
(Contract DE-AC06-76RL-01830)
(DE85-010943; PNL-5460-Vol-1) Avail: NTIS HC A08/MF A01

The Green River Ambient Model Assessment (GRAMA) program conducted at the US Department of Energy's Pacific Northwest Laboratory for the US Environmental Protection Agency is discussed. The GRAMA program has, as its ultimate goal, the development of validated air quality models that can be applied to the complex terrain of the Green River Formation of western Colorado, eastern Utah, and southern Wyoming. The Green River Formation is a geologic formation containing large reserves of oil shale, coal, and other natural resources. Development of these resources may lead to a degradation of the air quality of the region. Air quality models are needed immediately for planning and regulatory purposes to assess the magnitude of these regional impacts. One of the models being developed for this purpose within GRAMA - specifically a model to predict short averaging time (less than or equal to 24 h) pollutant concentrations resulting from the mesoscale transport of pollutant releases from multiple sources is documented. MELSAR has not undergone any rigorous operational testing, sensitivity analyses, or validation studies. Testing and evaluation of the model are needed to gain a measure of confidence in the model's performance. DOE

N85-33609# Pacific Northwest Lab., Richland, Wash.
CONTROL TECHNOLOGY FOR RADIOACTIVE EMISSIONS TO THE ATMOSPHERE AT US DEPARTMENT OF ENERGY FACILITIES: THE LOS ALAMOS MESON PHYSICS FACILITY
E. B. Moore and H. T. Fullam Mar. 1985 22 p refs
(Contract DE-AC06-76RL-01830)
(DE85-011402; PNL-4621-Add-1) Avail: NTIS HC A02/MF A01

The purpose of this addendum is to provide information to the US Environmental Protection Agency on existing technology at the Los Alamos Meson Physics Facility (LAMPF) for the control of radionuclide emissions to the atmosphere and on possible additional control technology that could further reduce these emissions. Emission of short-lived air activation products from the LAMPF in 1983 increased substantially over 1981 and 1982 to a total of 464 thousand curies, resulting in a maximum site boundary dose calculated by the US Department of Energy to be 48.4 millirem per year. Existing control technology consists of an air collection system and a stack which provides for some holdup and decay of the short-lived isotopes produced at the beam stop and ion target areas. Modifications are presently being installed at the beam stop to improve experimental conditions, which will also

reduce the formation of air activation products at the beam stop and provide some additional holdup time. Also under consideration is the installation of a new air tunnel and stack, at a different location, to further increase holdup time of air activation products produced at the beam stop. DOE

N85-33610# Pacific Northwest Lab., Richland, Wash.
TECHNOLOGY OF OFF-GAS TREATMENT FOR LIQUID-FED CERAMIC MELTERS
P. A. Scott, R. W. Goles, and R. D. Peters May 1985 113 p refs
(Contract DE-AC06-76RL-01830)
(DE85-012467; PNL-5446) Avail: NTIS HC A06/MF A01

The technology for treating off gas from liquid-fed ceramic melters (LFCMs) has been under development at the Pacific Northwest Laboratory (PNL) since 1977. This report presents the off-gas technology developed at PNL and by others to establish a benchmark of development and to identify technical issues. Tests conducted on simulated (nonradioactive) wastes have provided data that allow estimation of melter off-gas composition for a given waste. Mechanisms controlling volatilization of radionuclides and noxious gases are postulated, and correlations between melter operation and emissions are presented. Off-gas treatment systems require primary quench scrubbers, aerosol scrubbers, and final particulate filters. Depending on the composition of the off gas, equipment for removal of ruthenium, iodine, tritium, and noxious gases may also be needed. Nitrogen oxides are the most common noxious gases requiring treatment, and can be controlled by aqueous absorption or catalytic conversion with ammonia. High efficiency particulate air (HEPA) filters should be used for final filtration. DOE

N85-33611# Department of Energy, Idaho Falls, Idaho.
THE 1984 ENVIRONMENTAL MONITORING PROGRAM REPORT FOR IDAHO NATIONAL ENGINEERING LABORATORY SITE
D. L. Hoff, E. W. Chew, and R. L. Dickson May 1985 52 p refs
(Contract DE-AS07-80ID-12082)
(DE85-011209; DOE/ID-12082/84) Avail: NTIS HC A04/MF A01

The results of the various monitoring programs for 1984 indicated that radioactivity from INEL Site operations could not be distinguished from worldwide fallout and natural radioactivity in the region surrounding the Site. Although some radioactive materials were discharged during Site operations, concentrations and doses to the surrounding population were of no health consequence and were far less than State of Idaho and federal health protection guidelines. This report describes the air, water, and foodstuff samples routinely collected at the INEL boundary locations and at locations distant from the INEL Site; and it compares and evaluates the sample results, discussing implications, if any. The report also summarizes significant environmental activities at the INEL Site during 1984, nonradioactive and radioactive effluent monitoring at the Site, and the US Geological Survey (USGS) groundwater monitoring program. DOE

N85-33612# Sandia Labs., Albuquerque, N. Mex.
A 1984 ENVIRONMENTAL SUMMARY: SANDIA NATIONAL LABORATORIES TONOPAH TEST RANGE, TONOPAH, NEVADA
G. C. Millard and L. W. Lathrop Apr. 1985 8 p refs
(Contract DE-AC04-76DP-00789)
(DE85-011145; SAND-85-0551) Avail: NTIS HC A02/MF A01

The Tonopah Test Range is located about 160 air miles northwest of Las Vegas, Nevada, and covers 525 square miles within the Nellis Air Force Base Bombing and Gunnery Range. The range is used for various DOE tests involving high and low altitude projectiles. Operations that affect the environment are mainly road construction, preparation of instrumentation sites, and disturbance of the terrain from projectile impacts. Monitoring of the test range is done annually by the US Environmental Protection Agency to supplement Sandia's monitoring effort. Monitoring results indicate that test range operations do not adversely affect the offsite environment or the public. DOE

N85-33613# Systems Applications, Inc., San Rafael, Calif.
EVALUATION OF THE 2DFLOW AND HYBRID COMPLEX-TERRAIN DISPERSION MODELS WITH THE 1980 ASCOT DATA BASE FROM THE GEYSERS Final Report
T. W. Tesche, J. L. Haney, and R. E. Morris Nov. 1984 59 p refs
(Contract W-7405-eng-48)
(DE85-012960; UCRL-15662; ASCOT-84-8) Avail: NTIS HC A04/MF A01

Data collected during 5 tracer experiments was used to test the predictive performance of two numerical, grid based complex terrain dispersion models - the 2DFLOW and Hybrid models. The 2DFLOW model was developed by researchers at Savannah River National Laboratory (Garrett and Smith, 1982, 1984); the Hybrid model was developed by Systems Applications, Inc., and has been applied to air quality problems and in model evaluation studies for several years (Tesche, 1983). This study closely parallels a more extensive model evaluation effort at the Geysers in which four models - Mathew, ADPIC, SMOG, Hybrid, and 2DFLOW - were evaluated with additional tracer experiments from the 1981 ASCOT program and from earlier tracer studies conducted between 1978 to 1980 (Tesche, Haney, and Norris, 1984a,b; Tesche, 1984). A brief overview of the theoretical formulation of the 2DFLOW and Hybrid models is given. Simulation results for each model for the five 1980 ASCOT drainage experiments are presented. DOE

N85-33614# Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
DEVELOPMENT OF A MICROORIFICE UNIFORM DEPOSIT CASCADE IMPACTOR Final Report, 7 Jul. 1983 - 24 Aug. 1984
V. A. Marple and K. L. Rubow 24 Aug. 1984 36 p refs
(Contract DE-FG22-83PC-61255)
(DE85-006765; DOE/PC-61255/T1) Avail: NTIS HC A03/MF A01

The purpose of this project was to design, build, calibrate, and deliver two microorifice cascade impactors to the Department of Energy. One of these impactors was to be of a conventional nonrotating design and the other was to be uniformly deposited upon the impaction plate. In this report, the design of the impactors is presented, the calibration procedure described, and the resulting calibration curves discussed. DOE

N85-33615# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Chemie.
THE DEGRADATION OF POLLUTANTS IN WATER AND WASTE WATER BY MEANS OF ELECTRON OR GAMMA IRRADIATION
Emil Proksch and Peter Gehringer Mar. 1985 15 p refs In GERMAN; ENGLISH summary Submitted for publication
(OEFZS-4317; CH-345/85) Avail: NTIS HC A02/MF A01

The radiation-induced degradation of pollutants in potable water and waste water are treated. The fundamentals of the method, status, and technical and economic aspects are described. The degradation can be pushed very far, and no secondary effects occur. Especially interesting are the degradation of tri and perchlorethylene, the decoloring of dyeworks waste water, and the partial degradation of persistent compounds. Electron accelerators are the cheapest radiation source. The combination of irradiation and ozonization, leading to synergisms, is attractive.
Author (ESA)

N85-33616# Research Inst. of National Defence, Umea (Sweden).
NORDIC ASSOCIATION FOR AEROSOL RESEARCH (NOSA) AEROSOL SYMPOSIUM: PROGRAM AND ABSTRACTS
Mats Ahlberg, ed. Nov. 1985 54 p refs Partly in ENGLISH and SWEDISH Symp. held at Umea, Sweden, Nov. 1984 Sponsored by Nordic Association for Aerosol Research, Research Inst. of National Defence, Swedish Work Environment Fund, and National Swedish Environment Protection Board
(FOA-E-40019) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

Indoor and outdoor aerosols; sampling; in-situ determination of aerosol acidity; combustion residues; aerosol dynamics in

forest stands; metal chemical characterization; long-term carcinogenicity effects of chlorated dioxines; inhalation toxicity of military smoke; aerosol equipment; electrostatic enhanced filtration in fibrous filters; simulation of dispersed ashes with an aerosol produced in the laboratory; automatic aerosol radioactivity analyses by the capillary method; and use of particle counters were discussed. Author (ESA)

N85-33617# Centro Informazioni Studi Esperienze, Milan (Italy).
ESTIMATION OF Sr90 AND Cs137 ACTIVITY INTRODUCED AND ACCUMULATION IN THE Po BASIN UNTIL 1983 [STIMA DELLE ATTIVITA' DI STRONZIO-90 E DI CESIO-137 RICADUTE E CUMULATE NEL BACINO DEL PO FINO AL 1983]
G. Bonfanti and Z. Albertazzi (Parma Univ.) 1984 21 p refs In ITALIAN Presented at 2nd Congr. Nazl. della Soc. Ital. di Ecol. Symp. Radioecol., Padua, Italy, 25-28 Jun. 1984 Original contains color illustrations
(CISE-2515) Avail: NTIS HC A02/MF A01

A statistical model of the accumulation and distribution of radioactive contaminants in the Po basin is presented. Statistical data of nuclear test fall-out in the last 40 years and rain data in the Po basin are utilized in the model. The Sr90 transported annually by the Po river is estimated. It is shown that the knowledge of radioactive contaminants released in the atmosphere by nuclear tests can be used to predict long term environmental effects. Author (ESA)

N85-33618# Systems Applications, Inc., San Rafael, Calif.
DEVELOPMENT OF A CHEMICAL KINETIC MECHANISM FOR THE US EPA (ENVIRONMENTAL PROTECTION AGENCY) REGIONAL OXIDANT MODEL Interim Report, Aug. 1982 - Jul. 1984
G. Z. Whitten, R. G. Johnson, and J. P. Killus Apr. 1985 266 p refs
(Contract EPA-68-02-3738)
(PB85-185858; EPA-600/3-85-026) Avail: NTIS HC A12/MF A01 CSCL 04A

A new generalized mechanism for use in EPA's regional oxidant model has been developed. The mechanism is based on the carbon-bond concept in which organics are grouped according to the type of carbon bonding that is found in the various classes of organics. The mechanism treats biogenic as well as anthropogenic hydrocarbons. The mechanism was tested against multi-day chamber data collected by the University of California, Riverside and against isoprene/NOx data obtained in the outdoor chamber facility of the University of North Carolina. In addition to a description of the mechanism, guidance is also given on how emission data should be partitioned into the various organic groupings that are used in the mechanism. DOE

N85-33619# Systems Applications, Inc., San Rafael, Calif.
MODELING OF AUTO EXHAUST SMOG CHAMBER DATA FOR EKMA DEVELOPMENT Final Report, Aug. 1982 - Jul. 1984
G. Z. Whitten, J. P. Killus, and R. G. Johnson Apr. 1985 368 p refs
(Contract DPA-68-02-3735)
(PB85-186492; EPA-600/3-85-025) Avail: NTIS HC A16/MF A01 CSCL 04A

A new generalized mechanism for photochemical smog has been developed. The mechanism is suitable for use in the Empirical Kinetics Modeling Approach (EKMA) to estimate the control of volatile organic compounds that is needed to achieve the National Ambient Air Quality Standard for ozone. The mechanism developed is called the CBM-X, and it is the fourth lumped-parameter mechanism to be designed in accordance with the carbon-bond reaction concept. The principal features that distinguish the CBM-X from previous carbon-bond mechanisms include separating formaldehyde from the other oxygenates, treating toluene separately from the other aromatics and including a more detailed, up-to-date representation of aromatic hydrocarbons chemistry. The CBM-X was tested by comparing the predictions obtained with the mechanism against smog chamber data of dilute auto exhaust/oxides of nitrogen mixtures obtained in the outdoor smog chamber facility operated by the University of North Carolina. DOE

N85-33620# Battelle Columbus Labs., Ohio.
ATMOSPHERIC REACTION PRODUCTS FROM HAZARDOUS AIR POLLUTANT DEGRADATION Final Report, Apr. 1982 - Mar. 1984
C. W. Spicer, R. M. Riggin, M. W. Holdren, F. L. DeRoos, and R. N. Lee Apr. 1985 88 p refs
(Contract EPA-68-02-3169)
(PB85-185841; EPA-600/3-85-028) Avail: NTIS HC A05/MF A01 CSCL 04A

The products of selected hazardous air pollutants (HAPs) as they react in the atmosphere were investigated. Many hazardous or potentially hazardous organic compounds are emitted into the atmosphere and are subject to chemical change by photolysis, or by reaction with a number of highly reactive species including free radicals ozone, and nitrogen oxides. It is important to understand both the fate and the persistance of a HAP in order to assess its health significance. However, for many HAPs, the major atmospheric reaction products have not been identified. A number of the target HAPs were studied in Battelles 17.3 cu m smog chamber to determine major reaction products and to derive an estimate of atmospheric lifetime. Following the chamber studies, research was devoted to development of field-compatible sampling and analysis methods for those HAP reaction products which: (1) represent potential hazard, and (2) for which current methods are unavailable or unsuitable. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-33621 Institut d'Aeronomie Spatiale de Belgique, Brussels.
OZONE DURING SUDDEN STRATOSPHERIC WARMING: A THREE-DIMENSIONAL SIMULATION
K. Rose and G. Brasseur 1984 14 p refs Presented at Ozone Symp., Thessaloniki, Greece, 3-7 Sep. 1984 Submitted for publication
(Aeronomica-Acta-A-292-1984) Avail: Issuing Activity

A three dimensional coupled dynamical-chemical model which simulates the behavior of ozone during a winter stratospheric warming was used to study effects in the middle stratosphere (12 mb) where the chemical lifetime of odd oxygen is quite long and transport plays a major role. The model is based on primitive equations solved using a finite difference technique. Results suggest that a sudden stratospheric warming leads to a hemispheric increase of O3 in the middle atmosphere up to 60 km. Author (ESA)

N85-33622 Institut d'Aeronomie Spatiale de Belgique, Brussels.
VOIGT LINE PROFILE COMPUTATION OF INFRARED LINES IN THE STRATOSPHERE AND MESOSPHERE [CALCULS DU PROFIL DE VOIGT APPLIQUES AUX RAIES INFRAROUGE DE LA STRATOSPHERE ET DE LA MESOSPHERE]
C. Muller 1985 18 p refs In FRENCH; ENGLISH summary Submitted for publication
(Aeronomica-Acta-A-294-1985) Avail: Issuing Activity

The Whiting (1967) empirical approximation to the Voigt line profile and a rigorous computation are compared. The Whiting approximation is shown to lead to identical results for the interpretation of Spacelab 1 spectra between 80 and 30 km altitude. The relative error of the analytical approximation is studied and shown to be nonnegligible only in the case of ultrahigh resolution studies. Author (ESA)

N85-33623 Institut d'Aeronomie Spatiale de Belgique, Brussels.
ACETONITRILE IN THE EARTH'S ATMOSPHERE: AN UPPER LIMIT DEDUCED FROM INFRARED SOLAR SPECTRA

Christian Muller 1985 13 p refs Submitted for publication (Aeronomica-Acta-A-295-1985) Avail: Issuing Activity

An upper limit to the atmospheric acetonitrile mixing ratio of 3.2 times 10 to the minus 11th power is deduced from the high resolution Kitt Peak infrared atlas of the solar spectrum. The survey of the spectral region of CH3CN main absorption shows only stratospheric ozone lines and 1 water vapor line and does not permit any positive identification of acetonitrile. Author (ESA)

N85-33624*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

DETERMINATION OF BAND OSCILLATOR STRENGTHS OF ATMOSPHERIC MOLECULES FROM HIGH RESOLUTION VACUUM ULTRAVIOLET CROSS SECTION MEASUREMENTS Semiannual Status Report, 1 Nov. 1984 - 30 Apr. 1985

W. H. Parkinson Aug. 1985 13 p refs

(Grant NAG5-484)

(NASA-CR-176150; NAS 1.26:176150; SASR-1) Avail: NTIS HC A02/MF A01 CSCL 04A

An account is given of progress during the six month period 1/11/84 to 4/30/85 in work on: (1) rovibronic assignments of the Schumann-Runge bands of O2-18; and (2) optical depth measurements of the Schumann-Runge bands of O2-18. The work summarized above is part of a comprehensive spectroscopic investigation of the absorption wavelengths, rotational line assignments, cross sections, and band oscillator strengths of the Schumann-Runge bands of O2-18 and O-18 O-16 in the wavelength region 175-205 nm. The investigation is conducted at high resolution with a 6.65 m scanning spectrometer/spectrograph which is, by reason of its small instrumental width (FWHM = 0.0013 nm), uniquely suitable for cross section measurements of molecular bands with discrete rotational structure. Absolute cross sections, which are independent of the instrumental function and from which band oscillator strengths are directly determined, will be measured for the absorption bands that are most predissociated. B.W.

N85-33625*# International Council of Scientific Unions, Urbana, Ill.

MIDDLE ATMOSPHERE PROGRAM. HANDBOOK FOR MAP, VOLUME 11

C. F. Sechrist, Jr., ed. Jun. 1984 153 p refs

(Contract NASw-3805)

(NASA-CR-176107; NAS 1.26:176107) Avail: NTIS HC A08/MF A01; also available from SCOSTEP Secretariat, Illinois Univ., 1406 West Green Street, Urbana, Ill. 61801 CSCL 04B

An overview is presented of the research activities and objectives of the middle atmosphere program (MAP). Status reports are presented of projects underway in the area of middle atmosphere climatology and atmospheric chemistry condensed minutes of MAP steering committee meetings are contained in this volume. Research recommendations for increased U.S. participation in the middle atmosphere program are given. B.W.

N85-33626# National Oceanic and Atmospheric Administration, Washington, D. C. National Environmental Satellite Data and Information Service.

THE USE OF TOMS DATA IN EVALUATING AND IMPROVING THE TOTAL OZONE FROM TOVS MEASUREMENTS

James H. Lienesch and Prabhat K. K. Pandey (Science Systems and Applications, Inc., Seabrook, Md.) Jul. 1985 25 p refs (NOAA-TR-NESDIS-23) Avail: NTIS HC A02/MF A01

Total ozone from the Total Ozone Mapping Spectrometer (TOMS) has been regressed against brightness temperatures from the TIROS Operational Vertical Sounder (TOVS). The TOMS data provide a vast improvement over the amount of ozone data from the Dobson network currently used to compute the regression coefficients for the operational retrieval of total ozone from the infrared sounders on NOAA satellites. The TOMS data make it possible to derive regression coefficients for smaller latitude zones and, for the first time, in a straightforward fashion in the Southern Hemisphere. Improvements to be realized upon implementation of the new series of regression coefficients are detailed. As measured by the coefficients of variation, the average errors in the computed satellite ozone are reduced by more than 30 percent. Comparison with the TOMS total ozone shows that the operational TOVS total ozone exhibits a seasonally-dependent bias in the Northern Hemisphere and a nearly constant bias in the Tropics and Southern Hemisphere. Author

N85-33627# Stanford Univ., Calif. Space Telecommunications and Radioscience Lab.

A REAL TIME INDEX OF GEOMAGNETIC BACKGROUND NOISE FOR THE MAD (MAGNETIC ANOMALY DETECTION) FREQUENCY BAND Technical Report, 15 May 1983 - 31 Dec. 1984

A. Bernardi, A. C. Fraser-Smith, and O. G. Villard Feb. 1985 44 p

(Contract N00014-83-K-0390)

(AD-A155717; SU-E724-1) Avail: NTIS HC A03/MF A01 CSCL 17/6

An index of geomagnetic activity in the upper part of the ultra low frequency (ULF) range (less than 4.55 Hz) has been developed. This index will be referred to as the MA index (magnetic activity index). The MA index is prepared every half hour and is a measure of the strength of the geomagnetic activity in the Pc1-Pc3 pulsation frequency range during that half hour period. Activity in the individual Pc pulsation ranges can also be measured, if desired. The index is calculated from the running average of the full-wave rectified values of the band pass filtered geomagnetic signals and thus it provides a better indication of the magnitude of these band pass filtered magnetic pulsations than does the ap index, for example. Daily variations of the band pass filtered magnetic signals are also better captured by the MA index. To test this system we used analog tape recordings of wide-band geomagnetic signals. The indices for these tapes are presented in the form of plots, together with a comparison with the ap indices of the same time intervals. The MA index shows the daily variation of the geometric signals quite clearly during times when there is strong activity, i.e., when the ap index values are large. Because impulsive signals, such as lightning discharges, tend to be suppressed in the averaging process, the MA index is insensitive to impulsive noise. It is found that the time variation of the MA index is in general markedly different from the variation of the ap index for the same time intervals. GRA

N85-33628# California Univ., Berkeley. Lawrence Berkeley Lab.

DISCONTINUOUS DEFORMATION ANALYSIS

G. Shi and R. E. Goodman Jun. 1984 17 p Presented at 25th US Symp. on Rock Mech., Evanston, Ill., 25 Jun. 1984

(Contract DE-AC03-76SF-00098)

(DE85-011208; LBL-17696; CONF-840633-17) Avail: NTIS HC A02/MF A01

The deformation of a discontinuous rock is a sum of individual translations, rotations, and strains of the component blocks. These produce opening and slip between blocks along the discontinuities. Rather than attempting to analyze such deformations with a mathematical model representing the geometric and stress/strain properties of all points a novel approach to solve the inverse problem was produced. Using a field of displacement measurements and a map of the system of discontinuities, the method determines the intrablock and interblock motions by a least squares formulation. Only two dimensional formulations are addressed here. However, computer codes were developed for three dimensional problems. DOE

N85-33629# Science Applications, Inc., Las Vegas, Nev.

TECTONIC STABILITY AND EXPECTED GROUND MOTION AT YUCCA MOUNTAIN

2 Oct. 1984 32 p refs

(Contract DE-AC08-83NV-10270)

(DE85-012004; DOE/NV-10270/2) Avail: NTIS HC A03/MF A01

A workshop was convened on August 7 to 8, 1984 at the direction of DOE to discuss effects of natural and artificial earthquakes and associated ground motion as related to siting of a high-level radioactive waste (HLW) repository at Yucca Mountain, Nevada. A panel of experts in seismology and tectonics was

assembled to review available data and analyses and to assess conflicting opinions on geological and seismologic data. The objective of the meeting was to advise the Nevada Nuclear Waste Storage Investigations (NNWSI) Project about how to present a technically balanced and scientifically credible evaluation of Yucca Mountain for the NNWSI Project EA. The group considered two central issues: the magnitude of ground motion at Yucca Mountain due to the largest expected earthquake, and the overall tectonic stability of the site given the current geologic and seismologic data base. DOE

N85-33630# California Univ., Berkeley.
FRACTURE DETECTION AND CHARACTERIZATION FOR GEOTHERMAL RESERVOIR DEFINITION
N. E. Goldstein Dec. 1984 13 p Presented at the 10th Ann. Workshop on Geothermal Reservoir Eng., Stanford, Calif., 22 Jan. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008677; LBL-18849; CONF-850107-7) Avail: NTIS HC A02/MF A01

Fracture detection and mapping techniques are discussed as follows: remote-sensing, surface, borehold (including borehold-to-borehole), and surface-to-borehole. Other experimental techniques and research needs are described. DOE

N85-33631# Fenix and Scisson, Inc., Mercury, Nev.
LITHOLOGY AND STRATIGRAPHY OF DRILL HOLES COMPLETED DURING 1984 IN LANL USE AREAS OF YUCCA FLAT, NEVADA TEST SITE, VOLUME 6
J. L. Gonzales, S. L. Drellack, Jr., and W. J. Davies 28 Aug. 1985 154 p
(Contract DE-AC08-84NV-10322)
(DE85-010695; DOE/NV-10322/6) Avail: NTIS HC A08/MF A01

This report is a compilation of data from drill holes completed during the calendar year 1984 in areas used by Los Alamos National Laboratory in Yucca Flat, Nevada Test Site. Data presented in this report includes hole locations, drilling statistics, a supplemental data sheet, stratigraphy and lithology penetrated, and selected geophysical logs including a log of drilling penetration rate. Lithologic description and stratigraphic identification of the Tertiary volcanic rocks are emphasized. DOE

N85-33632# Texas A&M Univ., College Station. Geodynamics Research Program.
SUBDUCTION ZONE TECTONIC STUDIES TO DEVELOP CONCEPTS FOR THE OCCURRENCE OF SEDIMENT SUBDUCTION Final Technical Report
Thomas W. C. Hilde Aug. 1984 150 p refs
(Contract DE-AC21-83MC-20213)
(DE85-011794; DOE/MC-20213/1820) Avail: NTIS HC A07/MF A01

The objective was to determine the fate of sediments at covergent lithospheric plate boundaries. The study focuses on the structures of the Circum-Pacific trenches and shallow portions of the associated subduction zones. Sediment distribution and the nature of sediment deformation was defined throught the various stages of plate convergence to determine if the sediments are subducted or accreted. The controlling factors for sediment subduction and/or accretion are determined. DOE

N85-33633# Bechtel National, Inc., San Francisco, Calif.
PROPOSED RESOURCE EVALUATION PLAN. SALTON SEA SCIENTIFIC DRILLING PROGRAM
Mar. 1985 75 p refs
(Contract DE-AC03-84SF-12194)
(DE85-011294; DOE/SF-12194/T1) Avail: NTIS HC A04/MF A01

A plan for evaluating the deep geothermal resource in the Salton Sea area of Imperial County, California is given. The plan is divided into two testing programs, followed by the modeling and evaluation of the underground geothermal resource. The testing program related to geological data collection includes acquiring and analyzing the core, running geophysical and temperature/pressure logs in both the deep well and the injection well, and carrying out extensive mud-logging activities. The flow testing program includes temperature, pressure, and flow measurements made in the well and surface facilities. Sampling and analysis of fluid and scale both in the well and at the surface facilities will also be carried out. DOE

N85-33634# Vermont State Agency of Environmental Conservation, Montpelier.
BEDROCK GEOLOGY OF THE BRATTLEBORO QUADRANGLE, VERMONT-NEW HAMPSHIRE
J. C. Hepburn, N. J. Trask, J. L. Rosenfeld, and J. B. Thompson, Jr. 1984 175 p
(Contract DE-FG02-81WM-46642)
(DE85-011027; DOE/WM-46642/T1) Avail: NTIS HC A08/MF A01

The Brattleboro quadrangle of southeastern Vermont and southwestern New Hampshire is underlain principally by metamorphosed Lower to Middle Paleozoic sedimentary and volcanic rocks. The area sits astride portions of three regional tectonic zones, from west to east; the Green Mountain anticlinorium, the Connecticut River-Gaspe synclinorium and the Bronson Hill Sequence and include strata ranging in age from Precambrian through Silurian. The geology of the Bronson Hill anticlinorium is discussed as the Eastern Sequence covering strata ranging in age from Ordovician to Lower Devonian. Granitic intrusivo rocks in the area belong to the Ordovician aged Oliverian Plutonic Series and the Devonian aged New Hampshire Plutonic Series. The structural deformation in the area is divided into the major folding stages: an earlier one during which large recumbent folds or nappes developed; and a later one in which the nappes were arched upward by rising domes. DOE

N85-33635# Pacific Northwest Lab., Richland, Wash.
ORGANIC SOLVENT ALTERATION OF HYDRAULIC PROPERTIES OF SEDIMENTARY ROCKS OF LOW PERMEABILITY: A REVIEW
D. S. Sklarew May 1985 27 p refs
(Contract DE-AC06-76RL-01830)
(DE85-012537; PNL-5501) Avail: NTIS HC A03/MF A01

A review of the current literature on hydrophysical interactions of organic solutes with sedimentary rocks of low permeability is presented. The motivation was the premise that low permeability rocks may act as secondary (aquifer) barriers for the containment of hazardous organic wastes, thus preventing these wastes from contaminating the groundwater. However, this premise may be incorrect if organic wastes can affect the hyraulic conductivity of these rocks. The results indicate that very little work has been done concerning interactions of organics with consolidated subsurface materials. Available information on three related topics was summarized: the effect of organic compounds on the hydrophysical properties of clays, case studies concerning the interactions of organic compounds with clays and sedimentary rocks, and the effect of shales on inorganic transport. These studies give an indication of some research areas that need to be explored with regard to the effect of organic compounds on the hydrophysical properties of sedimentary rocks; these research needs are briefly summarized. DOE

N85-33636# Utah Univ., Salt Lake City. Earth Science Lab.
INDICATIONS OF MINERAL ZONING IN A FOSSIL HYDROTHERMAL SYSTEM AT THE MEAGER CREEK GEOTHERMAL PROSPECT, BRITISH COLUMBIA, CANADA FROM INDUCED POLARIZATION STUDIES
S. H. Ward, J. X. Zhao (Ministry of Geology, Beijing), J. Groenwald, and J. N. Moore May 1985 40 p refs
(Contract DE-AC03-84SF-12196)
(DE85-011962; DOE/SF-12196/9) Avail: NTIS HC A03/MF A01

By measuring the induced polarization parameters m (chargeability) and tau (time constant) evidence was found that the center of a presumed fossil hydrothermal system at Meager Creek, British Columbia, lies south of the main manifestation of the present day convective hydrothermal system. What implication this finding has

for development of the present day system is unknown. However, some of the fractures formed during the development of the fossil hydrothermal system may serve as conduits for fluids of the present day system. The analysis is limited by the lack of availability of a good subsurface distribution of core samples. Nevertheless, a surface induced polarization survey is expected to yield information about the geometry of the fossil system. Such knowledge would have implications not only for Meager Creek but for other hydrothermal systems of Cascades volcano type. DOE

N85-33147# Joint Publications Research Service, Arlington, Va.
SPACECRAFT-AIDED RESEARCH DISCUSSED AT GEOLOGY CONGRESS Abstract Only
N. Konstantinov and Yu. Shchevyakov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 118 Transl. into ENGLISH from Turkmenskaya Iskra (Ashkhabad, USSR), 10 Aug. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-33637*# Ohio State Univ., Columbus. Dept. of Physics.
APPLICATION OF NONLINEAR LEAST SQUARES METHODS TO THE ANALYSIS OF SOLAR SPECTRA Final Report, Jun. 1984 - Jun. 1985
John H. Shaw Jul. 1985 35 p refs Prepared for JPL, Pasadena, Calif.
(Contract JPL-956928; JPL Proj. 9950-1169; RF Proj. 764155/716288)
(NASA-CR-176122; NAS 1.26:176122) Avail: NTIS HC A03/MF A01 CSCL 04B

A fast method of retrieving vertical temperature profiles in the atmosphere and of determining the paths of the rays producing the ATMOS occultation spectra has been developed. The results from one set of occultation data appear to be consistent with other available data. A study of sources of error, a search for other suitable features for measurement in the spectra, and modification of the program to obtain mixing ratio profiles have been initiated. Author

N85-33638# Edgerton, Germeshausen and Grier, Inc., Las Vegas, Nev. Remote Sensing Lab.
AIRBORNE CLOUD TRACKING MEASUREMENTS DURING THE THREE MILE ISLAND NUCLEAR STATION ACCIDENT, MIDDLETOWN, PENNSYLVANIA. DATE OF SURVEY: MARCH - JUNE 1979
R. H. Beers, Z. G. Burson, T. C. Maguire, and G. R. Shipman Dec. 1984 77 p refs
(Contract DE-AC08-83NV-10282)
(DE85-012060; EGG-10282-1009) Avail: NTIS HC A05/MF A01

The Department of Energy's Aerial Measuring Systems (AMS) flew aerial monitoring missions in response to the Three Mile Island nuclear accident. The first flight was made at 1600 hours EST on 28 March 1979, the first day of the accident. Over 150 flights were made during the period of greatest concern. Measurements included isotope identification, plume direction, and maximum radiation levels inside the plume. The highest exposure rate measured (15 milliroentgen per hour, mR/h) was at 300 feet altitude, 1/4 mile from the plant, at 1030 hours on 30 March 1979. The highest measurement at 1 mile was 4.5 mR/h; this occurred at 1600 hours the same day. The Nuclear Emergency Search Team's (NEST's) communication system and logistic support contributed significantly to the overall DOE coordination of off-site radiation measurements. The AMS also provided real time measurements of radioactive krypton gas during purging operations in June 1980. DOE

N85-33639# Oak Ridge National Lab., Tenn.
GLOBAL ENVIRONMENTAL TRANSPORT MODELS FOR TRITIUM
G. G. Killough and D. C. Kocher 1985 14 p refs Presented at 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotropic Appl., Dayton, Ohio
(Contract DE-AC05-84CR-21400)
(DE85-011437; CONF-850405-7) Avail: NTIS HC A02/MF A01

Obstacles to the construction of credible models of global tritium transport for use in dose assessments are discussed. Monitoring of tritium has shown that specific activities in precipitation over land are typically higher by a factor of three to four than those in precipitation over the oceans. Experience with modeling CO2 turnover in the oceans had led to the conclusion that two-box reservoir models of the ocean often give unsatisfactory representations of transient solutions. Failure to consider these factors in global models can lead to distorted estimates of collective dose and create difficulties in validation of the model against real data. These problems are illustrated with a seven-box model recommended by the National Council on Radiation Protection and Measurements in which the atmospheric compartment was forced to reproduce an exogenous function based on historic observations of HTO in precipitation at 50 deg N. The fresh water response underestimates data from the Ottawa River by a factor of about five, and the ocean surface response overestimates tritium data from the surface waters of the Northern Pacific by nearly an order of magnitude. DOE

N85-33640# Trinity Univ., San Antonio, Tex.
SOLAR ENERGY METEOROLOGICAL RESEARCH AND TRAINING PROGRAM: REGION 4 Final Report
E. Clark, T. Hallaron, and M. Herzog 1 Mar. 1985 173 p refs
(Contract DE-FG05-77ET-20152)
(DE85-011783; DOE/ET-20152/1985) Avail: NTIS HC A08/MF A01

Five categories of grant activities were pursued in the Region Four SMRT Program: development of new procedures of acquiring more accurate solar-meteorological data, particularly tilted surface and beam irradiance data; recording new, more accurate data sets; data analysis and/or algorithm development and verification; regional resource assessment; and education in the acquisition, analysis, and application of solar-meteorological data. Although activities in all five of these categories are described and referenced, this report focuses on the first three. The extensive new, quality-controlled data sets acquired at the primary research site at Trinity University are presented as daily and montly listings. Less extensive data sets recorded by Baylor University are included in separately bound appendices. Data sets acquired at the University of Houston are listed in references. The facilities, maintenance, and quality control procedures used at the primary site are documented. Magnetic tape copies of the data sets are referenced. The extensive data analysis and new algorithm developments are summarized and sources of further details referenced. Regional resource maps resulting from new regional resource assessments are included. Educational activities are briefly summarized. DOE

N85-33641# New York Univ., New York. Dept. of Applied Science.
MODEL PROJECTIONS OF TIME-DEPENDENT RESPONSE TO INCREASING CARBON DIOXIDE Final Report
M. I. Hoffert and B. P. Flannery May 1985 63 p refs
(Contract DE-AC02-81EV-10610)
(DE85-013326; DOE/EV-10610/4; NYU/DAS-85-137) Avail: NTIS HC A04/MF A01

The state of the art of mathematical models of transient climate change from historical and projected increases in atmospheric carbon dioxide and related factors is reviewed. Major conclusions are: (1) the transient climate changes over 10 to 100 year timescales are probably driven by several external factors acting simultaneously, as well as internal factors such as variations in ocean dynamics; (2) the response of global temperature to this forcing is not instantaneous, but is delayed by times of the order 10 to 100 years by thermal damping by the upper ocean; (3) the development of reliable models is hampered by lack of a clear validation strategy for testing models against observations; and

(4) when run with standard scenarios, current models predict a global warming of the order of 1 C by the year 200 relative to 1850, with an additional 2 to 5 C over the next century. The sensitivity of these predictions to uncertainties was not sufficiently explored. Specific research programs are recommended to improve our ability to predict transient climatic changes from continued fossil fuel burning. DOE

N85-33642# Institut Royal Meteorologique de Belgique, Brussels. Dept. d'Aerologie.
150 YEARS OF METEOROLOGY IN BELGIUM [150 ANS DE METEOROLOGIE EN BELGIQUE, 1833 - 1983]
A. DeRidder 1984 15 p In FRENCH
Avail: NTIS HC A02/MF A01

The history of meteorological observation in Belgium is summarized. The interactions with other national meteorological centers and international organizations are discussed. The organization and existing regulations are also described. Author (ESA)

N85-33643# World Meteorological Organization, Geneva (Switzerland).
THE 2ND WORLD METEOROLOGICAL ASSOCIATION REGIONAL ASSOCIATION (ASIA), 8TH SESSION Final Report
1985 159 p Presented at Geneva, 5-16 Nov. 1984
(WMO-642; ISBN-92-63-10642-8) Avail: NTIS MF A01; print copy available at WMO, Geneva

The eighth session of the WMO Asian Regional Association considered regional aspects of the World Weather Watch Program, the World Climate Program, Research and Development Program, Applications of Meteorology Program, and Hydrology and Water Resources Program. Education and training, technical cooperation and WMO long term planning were discussed. Author (ESA)

N85-33644*# World Meteorological Organization, Geneva (Switzerland).
METEOROLOGY AND SOCIETY: STATEMENTS PRESENTED AT THE 9TH CONGRESS UNDER AGENDA ITEM 12
1985 50 p
(WMO-643; ISBN-92-63-10643-6) Avail: NTIS MF A01; print copy available at WMO, Geneva SWFR 9

National meteorological and hydrological research activities of service to the welfare of society and to the promotion of national economies are outlined. Countries covered are: Brazil, China, Colombia, Dominica, Ethiopia, East and West Germany, India, Lesotho, Poland, Senegal, Union of Soviet Socialist Republics, Vietnam, and the Dominican Republic. Author (ESA)

N85-33645# Royal Netherlands Meteorological Inst., De Bilt. Physical Meteorology Div.
VERIFICATION OF DOPPLER SODAR MEASUREMENTS
A. C. M. Beljaars 1985 44 p refs
(KNMI-WR-85-2; ISSN-0169-1651) Avail: NTIS HC A03/MF A01

Doppler sodar wind profiles up to 300 m were compared with tower measurements. Results show that Doppler sodar is useful in determining boundary layer wind, inversion height, and turbulence intensity. Accuracy and height range depend on weather conditions and siting. Wind measurement accuracy is 1 m/sec. The rms difference of the horizontal wind components between sodar and tower measurements is also 1 m/sec. Wind measurements go up to 200 m at night and to 500 m during the day. Strong winds (> 15 m/sec) and rainy weather > 1 mm/hr) reduce the height range to 0. For inversion height measurement and diagnostics, it is useful to connect a facsimile to the sodar. Although the software eliminates fixed echos, it is better to avoid them because the number of samples is also reduced. Obstacles should be avoided between 50 and 200 m away from the antennas. Author (ESA)

N85-33646# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR APRIL 1985, MARCH 30, 1985, VOLUME 39, NO. 7
Apr. 1985 10 p
(PB85-183804) Avail: NTIS HC A02/MF A01 CSCL 04B

The report gives the precipitation and temperature weather outlook for periodic and seasonal variations for North America. DOE

N85-33647# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
RADAR WIND PROFILERS IN THE COLORADO NETWORK
R. G. Strauch, D. A. Merritt, and K. P. Moran Mar. 1985 78 p refs
(PB85-185486; NOAA-TM-ERL-WPL-120) Avail: NTIS HC A05/MF A01 CSCL 04B

Radar systems used to measure vertical profiles of the horizontal wind in nearly all weather conditions can use frequencies between about 40 and 1000 MHz. This report describes three radar systems that measure wind profiles continuously and automatically. They opearte at different frequencies (approximately equals 50 MHz, 405 MHz, and 915 MHz) but are designed with a common philosophy and use many identical subsystems. Descriptions of hardware, software, and data processing are included. DOE

N85-33648# Sandia Labs., Albuquerque, N. Mex.
DEVELOPMENT OF AN ADJUSTABLE BUOYANCY BALLOON TRACER OF ATMOSPHERIC MOTION. PHASE 1: SYSTEMS DESIGN AND DEMONSTRATION OF FEASIBILITY Interim Report
B. D. Zak, H. W. Church, A. L. Jensen, G. T. Gay, and M. D. Ivey Apr. 1985 164 p refs Sponsored by EPA
(PB85-185817; EPA-600/3-85-027) Avail: NTIS HC A08/MF A01 CSCL 04B

An adjustable buoyancy balloon tracer of atmospheric motion allows one to follow atmospheric flows in both the horizontal and the vertical, including the weak, sustained vertical motion associated with meso- and synoptic scale atmospheric disturbances. The design goals for the Balloon Tracer to be developed here specify a lifetime > or = 3 days, tracking range > or = 1000 km, a ceiling altitude > or = 500 mb (5.5 km), and the capability to respond to mean vertical flows as low as 1 cm/s. The balloon tracer is also to measure and telemeter selected meteorological variables, to be sufficiently inexpensive to permit use in significant numbers, and to be serviced by a ground system capable of handling several balloon tracers at a time. While the balloon tracer has applications throughout the atmospheric sciences, the immediate motivation for this effort is to meet the need to evaluate the accuracies of existing air pollution transport models, to establish source-receptor relationships to distances of order 1000 km, and to assess the inherent limits on the predictability of source impact at long distances. DOE

N85-33649# National Center for Atmospheric Research, Boulder, Colo.
DYNAMICS OF MESOSCALE WEATHER SYSTEMS: 1984 SUMMER COLLOQUIUM
Joseph B. Klemp, ed. 1984 610 p refs Colloq. held in Boulder, Colo., 11 Jun. - 6 Jul. 1984 Sponsored by NSF
(PB85-188266; NCAR/CQ-8+1984-ASP) Avail: NTIS HC A99/MF A01 CSCL 04B

The 1984 Summer Colloquium was conducted from 11 June to 20 July 1984, combining four weeks of seminars and discussion at NCAR with a two week American Meteorological Society (AMS) intensive course on Mesoscale Meteorology and Forecasting held at the University of Colorado (cosponsored by the Cooperative Institute for Mesoscale Meteorological Studies and the Environmental Research Laboratories of the National Oceanic and Atmospheric Administration). In the NCAR portion of the program, the author emphasized the fundamental aspects of mesoscale dynamics, including the mechanisms which produce significant mesoscale weather events, the dynamic processes which govern their evolution, and the scale interactions which modulate the energetics of disturbances throughout the mesoscale. DOE

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-33650*# Nova Univ., Dania, Fla.
AIR-SEA INTERACTION WITH SSM/I AND ALTIMETER
Jun. 1985 72 p refs Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176105; JPL-9950-1170; NAS 1.26:176105) Avail: NTIS HC A04/MF A01 CSCL 08J

A number of important developments in satellite remote sensing techniques have occurred recently which offer the possibility of studying over vast areas of the ocean the temporally evolving energy exchange between the ocean and the atmosphere. Commencing in spring of 1985, passive and active microwave sensors that can provide valuable data for scientific utilization will start to become operational on Department of Defense (DOD) missions. The passive microwave radiometer can be used to estimate surface wind speed, total air column humidity, and rain rate. The active radar, or altimeter, senses surface gravity wave height and surface wind speed. G.L.C.

N85-33651*# SeaSpace, San Diego, Calif.
LARGE-SCALE SEA SURFACE TEMPERATURE VARIABILITY FROM SATELLITE AND SHIPBOARD MEASUREMENTS
R. L. Bernstein and D. B. Chelton (Oregon State Univ., Corvallis) 30 Apr. 1985 40 p refs Prepared in cooperation with JPL, Pasadena, Calif. Original contains color illustrations
(NASA-CR-176123; JPL-9950-1142; NAS 1.26:176123) Avail: NTIS HC A03/MF A01 CSCL 08J

A series of satellite sea surface temperature intercomparison workshops were conducted under NASA sponsorship at the Jet Propulsion Laboratory. Three different satellite data sets were compared with each other, with routinely collected ship data, and with climatology, for the months of November 1979, December 1981, March 1982, and July 1982. The satellite and ship data were differenced against an accepted climatology to produce anomalies, which in turn were spatially and temporally averaged into two-degree latitude-longitude, one-month bins. Monthly statistics on the satellite and ship bin average temperatures yielded rms differences ranging from 0.58 to 1.37 C, and mean differences ranging from -0.48 to 0.72 C, varying substantially from month to month, and sensor to sensor. Author

N85-33652# Department of Energy, Washington, D. C.
SALINITY DRIVEN OCEANOGRAPHIC UPWELLING Patent Application
D. H. Johnson, inventor (to DOE) (Midwest Research Inst., Golden, Colo.) Filed 30 Aug. 1984 28 p
(Contract DE-AC02-83CH-10093)
(DE85-011664; US-Patent-Appl-SN-645650) Avail: NTIS HC A02/MF A01

The salinity driven oceanographic upwelling which is maintained in a mariculture device is discussed. The spacer tubes are received in an upper manifold plate spaced from the upper cover plate to define a surface water fluid flow path into the flow segregating tubes. A surface water-deep water counterflow is established with deep water flowing upwardly through the main duct interior for discharge beyond the upper manifold plate while surface water flows downwardly through the flow segregating tubes for discharge below the lower manifold plate. During such counterflow heat is transferred from the downflowing warm water to the upflowing cold water. The flow is maintained by the difference in density between the deep water and the surface water due to their differences in salinity. The upwelling of nutrient rich deep water is used for marifarming by fertilizing the nutrient deficient surface water. DOE

N85-33653# Department of Energy, Morgantown, W. Va. Energy Technology Center.
ARCTIC AND OFFSHORE RESEARCH Technology Status Report
Oct. 1984 32 p
(DE85-001995; DOE/METC-85/0219) Avail: NTIS HC A03/MF A01

The DOE Arctic and Offshore Research (AOR) effort is designed to meet the needs for a centralized, high quality, Arctic energy related data base and for long term, high risk research. The ultimate purpose of the DOE effort is to promote extensive private use of the evolving AOR technology data base in order to accelerate development of Arctic oil and gas resources. Current activities included determining the Arctic bibliographic data base and initiating most pieces of the research described above (except multiyear ice properties and pipeline research). Some of the FY 1984 major accomplishments are: four to five ice islands 1 to 2 miles in length drifting off the Ellesmere ice shelves north of Ellesmere Island were aerially surveyed. A report was completed on the location of the ice shelf edge, breakup, and regrowth of the Ellesmere ice shelves over the past two decades. Ice ridging shear zone studies have shown that the 6 to 10 feet high shoals usually under the shear zone are not totally destroyed from ice gouging from one year to the next, but that the ice gouging may be instrumental in initiating and maintaining the shoals, which may protect Arctic offshore structures. Airborne radar sensing techniques were used to determine the electromagnetic properties of sea ice and physical properties. DOE

N85-33384# Joint Publications Research Service, Arlington, Va.
BASIC PROPERTIES AND INTERPRETATION OF SYNTHESIZED RADAR IMAGES OF SEA WAVES WITH LONG SYNTHETIZATION TIME Abstract Only
A. V. Ivanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 3 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radiofiz. (Gorkiy), v. 26, no. 5, May 1983 p 540-550 Previously announced in IAA as A83-41793 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-33654# John B. Pierce Foundation of Connecticut, New Haven.
MICROWAVE RADIATION AND THERMOREGULATION Final Report, 1 Oct. 1982 - 30 Sep. 1984
E. R. Adair May 1985 57 p
(Contract F33615-82-K-0600)
(AD-A155718; USAFSAM-TR-85-3) Avail: NTIS HC A04/MF A01 CSCL 06/3

Adult male squirrel monkeys were equilibrated to one of three ambient temperatures (Ta-20, 26 and 32 C) and then re-equilibrated for a 90-min period in the presence of a 2450-MHz CW microwave field. Power densities of 10, 15, 20, and 25 mW/sq cm were explored (SAR=1.5, 2.25, 3.0, and 3.75 W/kg, respectively) at each T sub a=32 C. In accordance with the method of partitional calorimetry, the following autonomic responses of heat production and heat loss were measured during the experiments: metabolic heat production, respiratory evaporative heat loss, total evaporative heat loss, skin and deep body temperatures that allowed determination of heat flows within the body, and from the body to the environment. The monkeys achieved thermal balance by the mobilization of appropriate thermoregulatory responses. These included a reduction of metabolic heat production when cool vasodilation of tail and foot when thermoneutral T sub a, and initiation of thermoregulatory sweating when warm. The coefficient of heat transfer to the environment, derived from these measures, was the same as that determined directly in the test environment. GRA

N85-33655# Oak Ridge National Lab., Tenn. Biology Div.
CARCINOGENESIS OF NITRATED TOLUENES AND BENZENES SKIN AND LUNG TUMOR ASSAYS IN MICE Final Report, Nov.

1979 - Mar. 1983
T. J. Slaga, L. L. Triplett, L. H. Smith, and H. P. Witschi May 1985 34 p
(Grant DOE-IAG-40-1016-79; DA Proj. 3E6-1102-BS-08)
(AD-A155723; ORNL-TOX-82-1; ORNL-TM-9645; DE85-012081)
Avail: NTIS HC A03/MF A01 CSCL 06/20

A series of nitrated toluenes and benzene were tested for their capability to act as initiators, promoters or complete carcinogens in mouse skin. 2,6-dinitrotoluenes and 2-nitrotoluene were found to have weak skin tumor initiating activity. 2,4-dinitrotoluene, 2,6-dinitrotoluenes and 1,3,5-trinitrobenzene produced historical changes in skin which usually are produced by promoting agents; this finding suggests that the three compounds could have skin tumor promoting activity. However, a firm conclusion can only be reached following appropriate in vivo tests. In the lung tumor assay, none of the chemicals tested gave an unequivocal positive response. A borderline positive result for unpurified 2,6-dinitrotoluene could not be repeated when the purified compound was reassayed in the same assay. GRA

N85-33656# Department of Energy, Washington, D. C.
ANTIHYPERTENSIVE NEUTRAL LIPID Patent Application
F. L. Snyder and M. L. Blank, inventor (to DOE) Filed 26 Oct. 1984 12 p
(Contract DE-AC05-76CR-00033)
(DE85-011625; US-Patent-Appl-SN-665214) Avail: NTIS HC A02/MF A01

The invention relates to the discovery of a class of neutral acetylated either-linked glycerolipids having the capacity to lower blood pressure in warm-blooded animals. This physiological effect is structure sensitive requiring a long chain alkyl group at the sn-1 position and a short carbon chain acyl group (acetyl or propionyl) at the sn-2 position, and a hydroxyl group at the sn-3 position. DOE

N85-33657# Brookhaven National Lab., Upton, N. Y.
HIT-SIZE EFFECTIVENESS THEORY APPLIED TO HIGH DOSES OF LOW LET RADIATION FOR PINK MUTATIONS IN TRADESCANTIA
M. N. Varma, V. P. Bond, and G. Matthews 1985 15 p refs Presented at the 9th Symp. on Microdosimetry, Toulouse, 20 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-011835; BNL-36434; CONF-850506-3) Avail: NTIS HC A02/MF A01

A hit-size effectiveness function which represents the probability of inducing a pink mutation in Tradescantia as a function of linear energy density has been obtained using observed pink mutation data for several different radiation qualities and their respective single event microdosimetric spectra. In obtaining this function only the linear portions of dose-response curves were used. A significant improvement of the concepts embodied in the proposed hit-size effectiveness theory would be the demonstration of its applicability at high doses (where multiple hits are produced) and high dose rates (at which no significant biological repair takes place). In this article details are given on preliminary calculations of the pink mutation frequency in Tradescantia at 1, 5, 10, 20, and 60 rads for 250 kVp X-rays, using the multi-hit spectra and the hit-size effectiveness function obtained on the basis of single hit microdosimetric spectra as outlined. A comparison of the calculated and observed pink mutation frequencies indicate excellent agreement and suggests the possibility of obtaining the hit-size effectiveness function from high dose biological-effect data obtained using low-LET radiations. DOE

N85-33658# Microbial Products, Inc., Fairfield, Calif.
PRODUCTION OF LIQUID FUELS AND CHEMICALS BY MICROALGAE Final Report
J. C. Weissman and R. P. Goebel Golden, Colo. Midwest Research Inst. Mar. 1985 115 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-83CH-10093)
(DE85-008780; SERI/STR-231-2649) Avail: NTIS HC A06/MF A01

It was determined whether simple open pond systems have application for the production of fuels from microalgae. Work concentrated on showing the potential microalgal yields that are possible from an open pond system on a sustained basis. Operational costs were documented to permit preliminary economic analysis of the system. Using two wildtype species in northern California a yearly average productivity of 15 gm/sq m/day, or 24 tons/acre/yr was obtained in water with TDS = 4 to 8 ppt. This can probably be increased to 20 to 25 gm/sq m/day or 32 to 40 tons/acre/y in southern California. Productivity can probably be further increased by using competitive strains screened for low respiration rates, tolerances to high levels of dissolved oxygen, broad temperature optima, and resistance to photoinhibition. In systems with randomized, turbulent mixing, productivity was independent of channel velocity at least for productivities up to 25 to 30 gm/sq m/day and velocities from 1 to 30 cm/sec. Storage product induction requires one to three days of growth in batch mode under n-depleted conditions. DOE

N85-33659# Pennsylvania State Univ., University Park. Dept. of Agronomy.
ANAEROBIC MICROBIAL TRANSFORMATIONS IN SUBSURFACE ENVIRONMENTS
J. M. Bollag, D. F. Berry, and P. Chanmugathas Apr. 1985 14 p refs Prepared in cooperation with BNL
(Contract DE-AC02-76CH-00016)
(DE85-012790; DOE/CH-00016/T7) Avail: NTIS HC A02/MF A01

The first draft of a literature review article entitled, Metabolism of Homocyclic (Benzenoid) and Heterocyclic Aromatic Compounds by Microorganisms Under Anaerobic Conditions, is completed. The article covers biodegradation of both heterocyclic and homocyclic aromatic compounds under a variety of conditions including nitrate reducing, fermentation, sulfate reducing, and methanogensis. Laboratory experiments were designed to study the anaerobic biotransformation processes involving organic substance derived from energy residual wastes. The test compounds selected for the initial anaerobic biodegradation experiments include aniline, indole, and pyridine. A Hungate apparatus is presently in operation. DOE

N85-33660# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
28 Jun. 1985 142 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-018) Avail: NTIS HC A07/MF A01

Progress and research results in the areas of life science, biomedical, and behavioral sciences are reported. Topics discussed include: agrotechnology, biochemistry, biophysics, biotechnology, ecology, environment, epidemiology, genetics, food technology, human factors, immunology, laser effects, medicine, microbiology, nonionizing radiation effects, pharmacology and toxicology, physiology, radiation biology, and virology. For individual titles, see N85-33661 through N85-33666.

N85-33661# Joint Publications Research Service, Arlington, Va.
SPEECH ANALYSIS SYSTEM FOR ASSESSING PILOTS' WORKING FITNESS Abstract Only c52
S. Dvigantsev *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 56-57 Transl. into ENGLISH from Med. Gazeta (Moscow), 10 Apr. 1985 p 4 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

The development of features of the equipment for distinguishing speech-signal parameters (SVPRS) system is reported. The system makes it possible to evaluate the emotions and working fitness of such operators on the basis of the sound of their speech. The system's components include a magnetic memory device, audiosignal filters, a frequency analyzer, sound-pressure recorders, a specially programmed minicomputer, and data-input devices and other instruments for processing recordings of human speech. With

the aid of the SVPRS, an operator's condition can be diagnosed on the basis of a single word containing two vowel sounds. Changes in voice tone which are indicative of stress can be detected. E.A.K.

N85-33662# Joint Publications Research Service, Arlington, Va.
FORMATION OF NEW MICROVESSELS IN SKELETAL MUSCLES OF RATS EXPOSED TO HYPOBARIC HYPOXIA FOR ONE WEEK Abstract Only
M. V. Kondashevskaya, V. B. Koshelev, and I. M. Rodionov *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 102 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 277, no. 3, Jul. 1984 p 748-751 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

The growth possibility of new microvessels in skeletal muscles under the influence of short-term hypoxia was studied. Experiments were performed on mongrel white rats 5 months in age. Inclusion of 3H-thymidine in the walls of microvessels was studied following its administration 1.5 hours before the animals were sacrificed. Angiogenesis occurred, beginning with rapid proliferation of the endothelial walls of the vessels either directly, or by extraction from the tissues of factor inducing angiogenesis. Hypoxia stimulates division of the vascular endothelial walls. The immediate functional changes in hemodynamics stimulate further structural changes in the vascular tree and angiogenesis. E.A.K.

N85-33663# Joint Publications Research Service, Arlington, Va.
EFFECTS OF IMMOBILIZATION AND HIGH-ALTITUDE ADAPTATION ON ENERGY METABOLISM IN RATS Abstract Only
D. A. Sutkovoy and V. A. Baraboy *In* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 102-103 Transl. into ENGLISH from Dokl. Akad. Nauk SSR, Ser. B: Geol. Khim i Biol. Nauki (Kiev), no. 2, Feb. 1985 p 76-78 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

High-altitude adapted and unadapted rats were subjected to stress by immobilization or hyperbaric oxygenation to assess the effects on lipid peroxidation in hepatic mitochondria and serum. Immobilization significantly enhanced peroxidation, as indicated by mitochondrial and serum levels of malonic dialdehyde. Concomitantly, oxidative phosphorylation was depressed to a statistically significant degree. In the altitude-adapted rats, the corresponding changes were far less pronounced. In the unadapted rats hyperbaric oxygenation elicited qualitatively and quantitatively analogous changes. However, adaptation potentiated the increase in lipid peroxidation induced by hyperbaric oxygenation and depression of oxidative phosphorylation. The correlation between activation of lipid peroxidation and inhibition of oxidative phosphorylation was ascribed to the damaging effects of the products of peroxidation on membrane systems. Alleviations of the effects of immobilization in the adapted rats was ascribed to enhancement of antioxidant systems in that group of animals. E.A.K.

N85-33664# Joint Publications Research Service, Arlington, Va.
EFFECTS OF BLOOD VOLUME OVERLOAD ON MYOCARDIAL ULTRASTRUCTURE IN RELATION TO ADAPTATION TO HIGH ALTITUDE HYPOXIA Abstract Only **c52**
A. K. Kadyraliyev and A. Yu. Tilis *In its* USSR Rept. Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 103 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 6, Nov. - Dec. 1984 p 36-39 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

The effects of high-altitude adaptation on the ultrastructural consequences of surgically induced mitral insufficiency were studied in dogs maintained at sea level and adapted to a 3200 m altitude. At sea level, compensatory myocardial hyperfunction was fully adequate to meet the hemodynamic challenge of the mitral lesion and provide an adequate oxygen supply to the body. No evidence of decompensation was manifested over a prolonged period of observation. It was found that high-altitude adaptation, alleviates the clinical consequences of surgically induced mitral lesions in dogs under alpine conditions. Author

N85-33665# Joint Publications Research Service, Arlington, Va.
CARDIORESPIRATORY FUNCTION AND WORK PERFORMANCE DURING ADAPTATION TO INDUSTRIAL LABOR IN MIDALPINE CONDITIONS Abstract Only **c52**
B. S. Mambetaliyev and K. U. Akynbekov *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 104 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 10-12 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

Various aspects of the cardiorespiratory system were analyzed in miners working under moderate altitude conditions in Kirghizia, using workers with more than 3 years of employment in the industry and newcomers to the region. The demanding physical labor was performed with no loss of work efficiency in comparison with similar work performed at low altitudes in the case of the adapted individuals. Despite the fact that adapted individuals present with a more efficiently functioning cardiorespiratory system at rest, and especially during physical exertion, working under moderate high-altitude conditions does place an additional demand on the system. E.A.K.

N85-33666# Joint Publications Research Service, Arlington, Va.
STRUCTURAL CHANGES IN THYROID DUE TO HIGH-ALTITUDE ADAPTATION IN KIRGHIZIA Abstract Only **c52**
V. T. Lyamtsev, Yu. K. Bazumovskiy, M. D. Turgunbayev, and M. O. Bragin *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 104-105 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 32-35 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

A variety of thyroid enzymes involved in redox reactions and in catalytic hydrolysis were monitored in outbred rats in Tuya-Ashu for a period of 60 days, to determine the effects of hypoxia on thyroid cytochemistry. Initially, the periodic acid shift (PAS) reaction became weaker, while cytochemical analysis showed elevation of succinic dehydrogenase, cytochrome oxidase, lactate dehydrogenase, and acid phosphatase activities. Adenosine triphosphatase (ATP) activity remained unaltered and alkaline phosphatase activity showed a time-dependent depression. The data indicate depressed thyroid function under hypoxic conditions for ca. the first 20 days. After 20 days, the cytochemical studies on enzymatic activities and the PAS reaction indicated functional recovery, which was essentially completed by day 60. E.A.K.

N85-33692# Joint Publications Research Service, Arlington, Va.
EFFECT OF SUBSTRATE MOISTURE ON GROWTH AND STRUCTURE OF CORN LEAF
A. F. Safonkin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 140-144 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 94-96 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-33667# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 2, MARCH - APRIL 1985
12 Aug. 1985 149 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) Avail: NTIS HC A07

Various topics in space biology and aerospace medicine are discussed. The effect of body position and immobilization on the intensity of spatial illusions in weightlessness, an investigation of the spectrum of human bile acids during 120-day antiorthostatic hypokinesia, and the effect of short-term antiorthostatic hypokinesia

on the dynamics of cardiorespiratory parameters during graded physical exercise are among the topics covered. For individual titles, see N85-33668 through N85-33692.

N85-33668# Joint Publications Research Service, Arlington, Va.
LABYRINTHINE AND EXTRALABYRINTHINE MECHANISMS OF DEVELOPMENT OF MOTION SICKNESS IN WEIGHTLESSNESS
A. D. Yegorov and Ye. M. Yuganov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 1-11 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 4-11 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

An important problem of aerospace medicine, space motion sickness is discussed. Relevant Soviet and foreign publications are surveyed. Possible mechanisms of the symptom-complex in the weightless state are discussed. The authors put forth their own ideas concerning current hypotheses of space motion sickness and discuss potential applicability of the theoretical concepts with respect to the prevention of this adverse symptom complex. R.J.F.

N85-33669# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL DISTINCTIONS OF ORGANIZATION AND REGULATION OF DAILY CYCLOGRAMS OF CREW ACTIVITIES DURING LONG-TERM SPACECRAFT c53
A. N. Litsov and V. F. Shevchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 12-18 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 12-16 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The results of analysis of work-rest cycles of the Salyut-6 and Salyut-7 prime crewmembers are discussed. The distribution of work-rest cycles within the day, week, month and the flight as a whole, their relation with other components of the time schedule, the effect of various factors involved on the health status and work capacity were studied. It was shown that specific work-rest cycles should be rigorously adhered to. It was demonstrated that proper planning and realization of work-rest cycles, as well as their correction during actual flight with respect to psychophysiological and biorhythmological variations are required to maintain good health condition and high work capacity of crewmembers. R.J.F.

N85-33670# Joint Publications Research Service, Arlington, Va.
OPERATOR'S FUNCTIONAL COMFORT ZONE WHEN CONTROLLING MOVING OBJECT c53
V. I. Myasnikov, B. N. Ryzhov, and V. P. Salnitskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 19-23 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 17-19 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

An objective evaluation of the psychic strain of six operators who performed multiparameter compensatory tracking of the moving object helped to identify the zone of changes of basic parameters. The control within this zone required a minimum psychophysiological cost (zone of functional comfort). The control beyond this zone was associated either with information overload or with a dramatic increase of the risk of failure. In five operators this led to a significant aggravation of the psychic strain. This study showed that special identification of the zone of functional comfort in the design of data display devices may be a method of optimizing man's work in the ergatic systems. R.J.F.

N85-33671# Joint Publications Research Service, Arlington, Va.
RAPID DETERMINATION OF CADET DISCIPLINE BY PROJECTIVE TESTS c53
V. I. Yevdokimov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 24-29 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 20-23 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The reliability of rapid prediction of the disciplined or undisciplined behavior of cadets using selected projective tests (the modified apperception test, the Rosenzweig test of picture frustration, and the Zondi test) was investigated. The tests were performed on 50 certified pilots and 400 cadets. By means of correlation and factor analyses the references given to the cadets by their seniors were compared with the results of the projective tests. It was found that the modified apperception test can be used to evaluate cadet's behavior within a comparatively short time. Marked extrapunitive trend combined with self-defense type of solution of the Rosenzweig test diminished the conformity of the personality and facilitated the development of conflict situations and undisciplined acts. The undisciplined cadets preferably selected pictures of seriously ill patients with epilepsy, catatonia or hysteria. These probability characteristics help to distinguish the cadets that need specific attention and supervision. R.J.F.

N85-33672# Joint Publications Research Service, Arlington, Va.
EFFECT OF BODY POSITION AND IMMOBILIZATION ON INTENSITY OF SPATIAL ILLUSIONS IN WEIGHTLESSNESS
F. A. Solodovnik and A. V. Chapayev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 30-33 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 23-26 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Test subjects were exposed to short-term weightlessness in various positions: standing, seated, supine in the cosmonaut's chair and on the flat surface with the head kept straight ahead, bent forward or backward. Their susceptibility to illusionary sensations was measured. It was found that the development of spatial illusions in the weightless state was not correlated with body position, head position relative to the torso or restraint type. Author

N85-33673# Joint Publications Research Service, Arlington, Va.
TYPOLOGICAL CHARACTERISTICS OF HEMODYNAMIC STATES OF HEALTHY SUBJECTS IN ORTHOSTATIC POSITION
V. A. Dartsmeliya and G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 34-43 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 26-33 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Central circulation and respiratory function of 90 healthy men, aged 24 to 45, were investigated during active and passive tilt tests. It was found that circulation can be influenced by the orthostatic factor which is expressed as the stage of early effects, intermediate stage, and the stage of stabilized hemodynamics. With respect to cardiac output the three basic hemodynamic states can be distinguished: hypokinetic, intermediate and hyperkinetic. It is shown that circulation parameters in clino- and orthostatics are reciprocally related. It is demonstrated that the cardiorespiratory parameters used can be selectively employed in the classification of the circulating state in orthostatics. It is claimed that the hemodynamic conditions reflect the sequential phase states in circulation regulation. The concept of clino and orthostatic normative characteristics of hemodynamics is presented. Author

N85-33674# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SPECTRUM OF HUMAN BILE ACIDS DURING 120-DAY ANTIORTHOSTATIC HYPOKINESIA
O. V. Zhiznevskaya and I. L. Medkova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 44-46 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 33-35 (For primary document see N85-33667 22-52)

Avail: NTIS HC A07

The composition of bile acids in the B and C portions of the duodenal juice of six essentially healthy test subjects exposed to 120-day head-down bed rest was investigated. As the exposure continued, the percentage content of bile acids conjugated with taurine increased and that of bile acids conjugated with glycine decreased. The rapid and significant decrease of the ratio of glycine conjugated to taurine conjugated bile acids suggests a specific modification of the synthetic function of hepatocytes under the above conditions. Author

N85-33675# Joint Publications Research Service, Arlington, Va.
VASCULAR MECHANISMS OF ADAPTATION TO ANTI-ORTHOSTATIC POSITION
T. A. Kabesheva, S. V. Kopanev, N. Ye. Panferova, and A. F. Zavadovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 47-53 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 35-39 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Using occlusion plethysmography and rheology, the state of peripheral circulation of 18 test subjects during 25 exposures to head-down tilt was investigated. The test subjects were subdivided into two groups: nine subjects actively changed their body position by 90 deg and nine others were passively transferred to the head-down position at an angle of -12 deg. It was found that regular training facilitated the development of vascular mechanisms which assisted adaptation to the head-down tilt: it decreased the tone of resistance vessels of the arms and legs and that of capacitance vessels of the legs; it increased the tone of cerebral resistance and capacitance vessels. The tone of leg capacitance vessels varied, depending on the type of training; passive tilting increased their compliance and active tilting decreased it. The final result of the tone redistribution in the peripheral vascular bed during training was a smaller increase of head blood content and a smaller fluid outflow from the legs. Author

N85-33676# Joint Publications Research Service, Arlington, Va.
CEREBRAL HEMODYNAMICS AND VENTRICULAR FUNCTION IN -15 DEG ANTIORTHOSTATIC POSITION
V. I. Sokolov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 54-58 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 39-42 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Sixteen men were exposed to head-down tilt at -15 deg for 16 hours. Cerebral circulation was examined by bipolar rheoencephalography, ventricular function by one-dimensional echoventriculometry, and blood pressure by Korotkoff's sounds. Group 1 consisting of 10 test subjects tolerated the antiorthostatic exposure well enough (they reported only blood rush to the head and moderate facial puffiness). They showed stable parameters of cerebral circulation, ventricle size, and mean blood pressure, which is indicative of adequate compensatory capabilities of their organisms. Group 2 consisting of 6 test subjects exhibited polymorphic clinical symptoms, including the syndrome of liquor hypertension (burst-like headache, autonomic dysfunction, etc). This was accompanied by decreased pulse pressure of cerebral vessels, primary in the vertebrobasilar area, instability of the vessel tone against the background of marked dilatation of the capacitance vessels and brain ventricles. Author

N85-33677# Joint Publications Research Service, Arlington, Va.
EFFECT OF SHORT-TERM ANTIORTHOSTATIC HYPOKINESIA ON DYNAMICS OF CARDIORESPIRATORY PARAMETERS DURING GRADED PHYSICAL EXERCISE
A. M. Genin, V. M. Baranov, V. G. Shabelnikov, N. M. Asyamolova, A. N. Kotov, M. Yu. Volkov, K. S. Yurova, and A. T. Poleshchuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 59-63 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 43-46 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Seven healthy volunteers were exposed to head down tilt at -15 for 5 hours. Before and after exposure they exercised on a bicycle ergometer in the supine and seated positions. During the study their respiration function, gas exchange and arterialized blood parameters were measured. It was found that after exposure the physical aerobic performance diminished. The changes detected suggest that a lower exercise tolerance can be caused not only by a decreased circulating blood volume but also by increased energy expenditures of the cardiorespiratory system itself. Author

N85-33678# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SOME ASPECTS OF AMINO ACID METABOLISM IN MAN DURING BRIEF EXPOSURE TO ANTI-ORTHOSTATIC HYPOKINESIA COMBINED WITH ULTRAVIOLET RADIATION
A. S. Ushakov, T. F. Vlasova, Ye. B. Miroshnikova, N. Ye. Panferova, and T. P. Murugova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 64-67 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 46-49 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Changes in the amino acid pool in the plasma of test subjects exposed to short term head down tilt combined with ultraviolet irradiation were investigated. Exposure to head down tilt alone (group 1 of 3 test subjects) and combined with ultraviolet irradiation (10 sessions) (groups 2 and 3 of 3 test subjects each) acted as a stress agent that diminished the amino acid pool. Exposure to 2 hour head down tilt in combination with 20 UV irradiations (groups 2 and 3) increased the amino acid pool as a result of inhibition of anabolic and stimulation of catabolic processes. The amino acid pool did not return to normal within the recovery period allowed. Author

N85-33679# Joint Publications Research Service, Arlington, Va.
GENERAL DESCRIPTION OF EXPERIMENT DEALING WITH RAT ONTOGENESIS ABOARD COSMOS-1514 BIOSATELLITE
L. V. Serova, L. A. Denisova, Z. I. Apanasenko, L. A. Bryantseva, and N. A. Chelnaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 68-74 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 49-53 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Ten female Wistar rats were exposed to zero g during 5 days, i.e., from gestation day 13 to day 18. After recovery the flight aminals showed a significant delay in weight gain, thymus involution, decreased liver weight, hemoglobin concentration. Nevertheless, their reproductive function did not differ from that of the controls; the rate of preimplantation and total fetal mortality as well as the number of live fetuses were very similar in the experimental and control animals. The flight group showed a slight decline of fetal weight and water content. The size of the litters produced by the flight and control rats was identical but the mortality rate of those former during the first 7 days after birth was significantly higher. This experiment has demonstrated that the mammalian fetus exposed to zero g during the last term of pregnancy, i.e., at the stage of active organogenesis, can grow and develop in the normal way. A large body of biological material was obtained for biochemical and histological examinations that will help evaluate the condition of dams, fetuses and newborns. Author

N85-33680# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL STUDY OF ANTIORTHOSTATIC HYPOKINESIA IN MONKEYS
A. S. Kaplanskiy, Ye. A. Savina, P. B. Kazakova, I. P. Khoroshilova-Maslova, G. M. Kharin, V. I. Yakovleva, G. I. Plakhuta-Plakutina, V. N. Shvets, and T. Ye. Burkovskaya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 75-84 refs Transl. into

ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 53-60 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Morphological examinations of rhesus monkeys (Macaca mulatta) exposed to head down tilt for 7 and 19 days are summarized. The major changes detected in various systems, organs and tissues are described. The changes are thought to be of different origin and caused by blood redistribution, hypokinesia per se and concommitant stress. It is emphasized that head down tilt is one of the most adequate methods for simulating effects of zero g in monkeys. Author

N85-33681# Joint Publications Research Service, Arlington, Va.
RAT PLASMA HORMONE LEVELS FOLLOWING FLIGHT ABOARD COSMOS-1129 BIOSATELLITE
R. A. Tigranyan, N. F. Kalita, L. Macho, and R. Kvetnansky *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 85-90 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 60-64 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The concentration of ACTH, insulin, glucagon, glucose, epinephrine, norepinephrine, thyrotrophic hormone, thyroxine, and triiodothyronine was measured in plasma of the rats flow for 18.5 days on Cosmos 1129. As a result of the flight, the concentration of insulin, thyrotrophic hormone, and triiodothyronine increased and that of thyroxine decreased. It is suggested that the above changes have been induced by an acute stress associated with biosatellite reentry and touchdown. Author

N85-33682# Joint Publications Research Service, Arlington, Va.
RESULTS OF MICROBIOLOGICAL STUDIES CONDUCTED DURING OPERATION OF SALYUT-6 ORBITAL STATION
S. N. Zaloguyev, A. N. Viktotov, V. M. Shilov, V. P. Gorshkov, K. V. Zarubina, M. M. Shinkareva, and T. Yu. Norkina *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 91-94 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 64-66 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The results of microbiological examinations of the Salyut 6 crewmembers and environment are presented. There were few cases of adverse changes in the automicroflora composition, i.e., propagation of staphylococci of a certain biotype among crewmembers. However, no over manifestations of infectious pathology were seen. This allows the conclusion that personal hygiene measures and general hygiene and antiepidemic measures taken before and during Salyut 6 missions were adequate and efficient. Author

N85-33683# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS IN FORMATION OF MICROFLORA ON CONSTRUCTION MATERIALS USED IN HABITABLE PRESSURIZED COMPARTMENTS
A. N. Viktorov and N. D. Novikova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 95-98 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 66-69 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The composition of microbial and fungal associations on nonmetal materials used in the interior design and equipment of enclosures was investigated when they were inhabited by men. It was found that the microorganisms formed on the structure materials were influenced by such factors as men and their specific microflora, accumulated water and dust, as well as the chemical structure of the polymers used. Author

N85-33684# Joint Publications Research Service, Arlington, Va.
COMPOSITION AND DYNAMICS OF BACTERIOCENOSIS ASSOCIATED WITH ALGAE IN HUMAN LIFE-SUPPORT SYSTEMS
Ye. M. Kondratyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 99-106 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 69-74 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The species and group composition as well as the number of bacteria concomitant with algae in the course of their continuous cultivation on a mineral medium as a self contained system and as part of the biological life support system were investigated. The major components of urine were passed to the reactor after its premineralization in a special unit. The experiments were carried out for 37 to 51 days. Under such cultivation conditions the number and generic composition of the algal microflora were stable. The common gas line between the algal reactors, units for urine microbiological mineralization and the manned module facilitated the generation of new bacterial groups which were, however, unable to develop in actively growing algal cultures and therefore disappeared rapidly. This indicates that the algal-bacterial cenosis within a biological life-support system has signs of a self-regulating system. Author

N85-33685# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL VALIDATION OF ALLOWABLE CONCENTRATIONS OF SODIUM AND POTASSIUM IN RECYCLED DRINKING WATER
V. A. Kondratyuk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 107-112 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 74-78 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

White noninbred rats were used to study the effect of reclaimed water containing 25-10 mg/l sodium and 2.5-10 mg/l potassium. The results show that consumption of water containing 50 mg/l sodium and/or 5 mg/l potassium disturbs their balance in the body. It is recommended to use water that contains 35 mg/l sodium and 4.0 mg/l potassium as a maximum, and 5.7 mg/l sodium and 0.6 mg/l potassium as a minimum. Author

N85-33686# Joint Publications Research Service, Arlington, Va.
MAMMALIAN TISSUE SENSITIVITY TO LONG-TERM EXPOSURE TO HIGH-INTENSITY STATIONARY MAGNETIC FIELDS
G. V. Galaktionova, V. M. Mastryukova, and A. D. Strzhizhovskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 113-117 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 78-81 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

The retinal epithelium, bone marrow and spermatogenic epithelium of mice exposed for 30 days to constant magnetic fields of 1.6 T were examined cytologically. During and after exposure the retinal and bone marrow epithelium showed no biologically significant deviations from normal. The mitotic changes were of small amplitude and insufficient to cause cell unbalance. No chromosome aberrations or degenerative changes in the cells were seen. In the spermatogenic epithelium the exposure to a constant magnetic field produced a destruction of mature cell elements. Due to this the total amount of spermatogenic cells was significantly lower during and immediately after exposure. Author

N85-33687# Joint Publications Research Service, Arlington, Va.
ELECTROANESTHESIA AS A MEANS OF CONTROLLING COLD STRESS OF LOCAL HYPOTHERMIA
L. L. Stazhadze, V. V. Sigayev, A. A. Titov, A. N. Romanov, L. G. Repenkova, and S. I. Avdeyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-

85-004) 12 Aug. 1985 p 118-122 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 81-85 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Local hypothermia has gained wide use in clinical practice in the last two decades. Selective cooling of individual organs and parts of the body has made it possible to attenuate significantly adverse changes in the body and, consequently, enhance the efficacy of treating many serious diseases. Considering the prospects of exploring extraterrestrial space, local hypothermia may expand significantly the existing capabilities of space medicine.
G.L.C.

N85-33688# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL MANIFESTATIONS OF HEMODYNAMIC CHANGES IN LUNGS OF MONKEYS SUBMITTED TO ANTI-ORTHOSTATIC HYPOKINESIA
V. I. Yakovleva and G. S. Belkaniya *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 123-126 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 85-87 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Comprehensive material has been accumulated to date on investigation of the effects of long-term clinostatic and anti-orthostatic hypokinesia (AOH) on man. In particular, it was established that, under hypokinetic conditions and particularly AOH, there is redistribution of blood in the body, intensification of venous return of blood to the heart, which leads to plethora of the atria and vessels in the pulmonary circulatory system. Recently, works have been published concerning investigation of hemodynamics in the pulmonary circulation using different methods (radioisotope, rheographic, catheterization of vessels). With these methods it was shown that both short- and long-term AOH is associated with an increase in volume of circulating blood in the lungs. Since hemodynamics in monkeys are similar to man, it was interesting to examine the lungs of monkeys during AOH using histological and morphometric methods.
G.L.C.

N85-33689# Joint Publications Research Service, Arlington, Va.
REGULATION OF PHYSICAL ACTIVITY IN ANTIORTHOSTATIC POSITION BY ACTING ON ADRENOSYMPATHETIC AND HYPOPHYSEO-ADRENOCORTICAL SYSTEMS
E. A. Shirinyan and O. M. Avakyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 127-130 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 87-89 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

It is common knowledge that the adrenosympathetic and adrenocorticopituitary systems play a leading role in adaptive reactions of an organism submitted to stress. There have been comprehensive investigations of their role and influence on different biological parameters during exposure to a physical load and a number of other stressors. The combined effect of physical and mental stimuli and their influence on work capacity have been studied considerably less.
G.L.C.

N85-33690# Joint Publications Research Service, Arlington, Va.
EFFECT OF EXPERIMENTAL MOTION SICKNESS ON POST-ROTORY NYSTAGMUS AND COUNTERROTATION ILLUSION
G. S. Ayzikov and G. N. Klyushnikova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 131-134 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 89-91 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Man's exposure to frequent and prolonged vestibular stimuli, which are associated with development of motion sickness (MS), leads to change in reaction of the system of semicircular canals to angular accelerations. Flattening of the cupulogram has been found in seamen. Prolonged operator work in a slowly revolving room lowers the intensity of the nystagmic reaction. Analogous findings were made on animals, and the effects were more marked with prolonged rotation and hypergravity. These facts are usually considered to be a reflection of adaptation processes in the vestibular system. A special role is attributed to prolonged and simultaneous stimulation of semicircular canals and otolith organs.
G.L.C.

N85-33691# Joint Publications Research Service, Arlington, Va.
CHEMICAL COMPOSITION OF MUSCA DOMESTICA L. LARVAL AND PUPAL BIOMASS WHEN DEVELOPING IN ORGANIC WASTE OF BIOLOGICAL LIFE-SUPPORT SYSTEM FOR MAN
Ye. G. Golubeva, T. S. Guryeva, and O. I. Tikhobayeva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 135-139 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 91-93 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Heretofore, only man performed the function of the heterotrophic element in man-plants models. In order to render such a system more closed, the model of its biocenotic structure should be considerably more complex. Studies aimed at finding organisms capable of occupying an ecological niche in a biological life-support system (BLSS) have been pursued for a long time for the purpose of enhancing the energy efficiency and further close mass exchange. Among such organisms, as a representative of the detritus feed chain, Musca domestica L. housefly was suggested, as its larvae are efficient users of organic waste such as human and animal excreta. In developing the ecological system, the larval biomass recovered after utilization of waste can be used as feed for animals in the heterotrophic link. For this reason, it is rather important to assess the feed qualities of larval biomass.
G.L.C.

N85-33692# Joint Publications Research Service, Arlington, Va.
EFFECT OF SUBSTRATE MOISTURE ON GROWTH AND STRUCTURE OF CORN LEAF **c51**
A. F. Safonkin *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 140-144 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 94-96 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

Experiments with higher plants aboard space vehicles were conducted in instruments with artificial substrates. Normal plant growth under such conditions depends on many environmental parameters. Water is one of the principal parameters that determines many vital functions.
G.L.C.

N85-33693*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SPACELAB 1 HEMATOLOGY EXPERIMENT (INS103): INFLUENCE OF SPACE FLIGHT ON ERYTHROKINETICS IN MAN
Carolyn S. Leach, J. P. Chen (Tennessee Univ., Knoxville), W. Crosby (Walter Reed Army Medical Center, Washington, D.C.), C. D. R. Dunn (Northrop Services, Inc. and Baylor Coll. of Medicine, Houston, Tex.), P. C. Johnson, R. D. Lange (Tennessee Univ., Knoxville), E. Larkin (Veterans Administration Hospital, Martinez, Calif.), and M. Tavassoli (Mississippi Univ., Jackson) Aug. 1985 73 p refs
(NASA-TM-58268; S-548; NAS 1.15:58268) Avail: NTIS HC A04/MF A01 CSCL 06E

An experiment conducted on the 10-day Spacelab 1 mission aboard the ninth Space Shuttle flight in November to December 1983 was designed to measure factors involved in the control of erythrocyte turnover that might be altered during weightlessness. Blood samples were collected before, during, and after the flight. Immediately after landing, red cell mass showed a mean decrease of 9.3 percent in the four astronauts. Neither hyperoxia

nor an increase in blood phosphate was a cause of the decrease. Red cell survival time and iron incorporation postflight were not significantly different from their preflight levels. Serum haptoglobin did not decrease, indicating that intravascular hemolysis was not a major cause of red cell mass change. An increase in serum ferritin after the second day of flight may have been caused by red cell breakdown early in flight. Erythropoietin levels decreased during and after flight, but preflight levels were high and the decrease was not significant. The space flight-induced decrease in red cell mass may result from a failure of erythropoiesis to replace cells destroyed by the spleen soon after weightlessness is attained. Author

N85-33694# Army Medical Bioengineering Research and Development Lab., Fort Detrick, Md.
EFFECTS OF LOW LEVEL CARBON MONOXIDE (CO) ON TRACKING AND MONITORING. AN ATTEMPT TO REPLICATE THE FINDINGS OF PUTZ ET AL. (1976) PROTOCOL 2 Final Report, 1983 - 1984
V. A. Benignus, K. E. Muller, C. N. Barton, and J. D. Prah Jan. 1985 52 p
(AD-A155722; USAMBRDL-TR-1812) Avail: NTIS HC A04/MF A01 CSCL 06/20

The present study was an attempt to replicate the experiment and findings of Putz, et at., (1976). In the Putz, et al., study it was shown that 5 percent COHb resulting from four hours of exposure to 70 ppm CO produced decrements in tracking and monitoring behavior in healthy young men. Intensive effort was made to assure that the Putz et al. procedure and equipment were duplicated. Certain procedural changes were introduced out of necessity or due to lack of exact information. The results of the present study using 22 healthy men did not show a statistically significant effect of CO exposure to 100 ppm for four hours on either tracking or monitoring. In the present study: (1) observed trends were in the same direction as those of Putz, et al., (2) results approached statistical significance criterion, and (3) several inadvertent methodological changes from Putz et al. apparently occurred. Due to these considerations and the findings of Putz, et al., (1976) and Putz (1979), it may be tentatively concluded that: (1) tracking may be sensitive to impairment by CO exposure, (2) monitoring does not appear to be affected by CO exposure, and (3) important variables in research on the effects of CO exposure on tracking appear to be the level of subject training and the task difficulty. GRA

N85-33695# Oak Ridge National Lab., Tenn.
LEGIONNAIRES' DISEASE BACTERIA IN POWER PLANT COOLING SYSTEMS: PHASE 2
R. L. Tyndall, S. W. Christensen, and J. A. Solomon Apr. 1985 99 p refs
(Contract DE-AC05-84OR-21400)
(DE85-011546; EPRI-EA-4017) Avail: NTIS HC A05/MF A01; Research Reports Center, Box 50490, Palo Alto, CA 94303

Legionnaires' Disease Bacteria (Legionella) are a normal component of the aquatic community. Various environmental factors that affect Legionella profiles in power plant cooling waters are investigated. The results indicate that each of the four factors investigated (incubation temperature, water quality, the presence and type of associated biota, and the nature of the indigenous Legionella population) is important in determining the Legionella profile of these waters. At incubation temperatures of 32 C and 37 C, waters from a power plant where infectious Legionella were not observed stimulated the growth of stock Legionella cultures more than did waters from plants where infectious Legionella were prevalent. This observation is consistent with Phase 1 results, which showed that densities of Legionella were frequently reduced in closed cycle cooling systems despite the often higher infectivity of Legionella in closed cycle waters. DOE

N85-33696# Brookhaven National Lab., Upton, N. Y.
PRACTICAL CONSEQUENCES OF THE ASSESSMENT OF DIFFERENT ENERGY HEALTH RISKS
L. D. Hamilton 1984 60 p refs Presented at the Intern. Workshop on Environ. Impacts of Energy Systems on Risk Management in the Eighties, San Miniato, Italy, 22 Jun. 1984
(Contract DE-AC02-76CH-00016)
(DE85-004538; BNL-35461; CONF-8406229-1) Avail: NTIS HC A04/MF A01

Four examples of the use by decision makers of health impact assessments are given. Comparative risk assessment of the health effects of coal and nuclear fuel cycles used in nuclear power plants siting and licensing hearings; health risks of acid deposition and other air transported pollutants, carried out as part of an assessment for the US Congress Office of Technology Assessment; public health risks of radon from uranium mining and milling, used in nuclear power plant licensing hearings; and review of the US Environmental Protection Agency's risk assessment for atmospheric radon-222 and daughters used by EPA in support of proposed standards are cited. DOE

N85-33697# Tennessee Univ., Oak Ridge. Graduate School of Biomedical Sciences.
THREE-DIMENSIONAL RECONSTRUCTION AND DATA DISPLAY OF CHROMOSOME STRUCTURE STUDIED BY ELECTRON MICROSCOPE TOMOGRAPHY
D. E. Olins 1985 11 p Presented at Computer Graphics '85, Dallas, 14 Apr. 1985 Prepared in cooperation with ORNL
(Contract DE-AC05-84OR-21400)
(DE85-011562; CONF-8504121-2) Avail: NTIS HC A02/MF A01

Modern transmission electron microscopes can be employed to generate useful and informative three dimensional reconstructions of asymmetric cell structures by adapting the principles of axial tomography and utilizing the power of digital image processing. An example of this technique, called electron microscope tomography (EMT), applied to analysis of the 3-D structure of an active eukaryotic gene in situ is presented. Future improvements in the field of EMT depend upon the development of methods for visualizing, editing and interpreting the rich image information of the 3-D reconstructions. DOE

N85-33139# Joint Publications Research Service, Arlington, Va.
RESULTS AND PROSPECTS OF PHYSIOLOGICAL RESEARCH DURING SPACEFLIGHTS
O. G. Gazenko *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 66-71 Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 7-11 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33140# Joint Publications Research Service, Arlington, Va.
INTRACARDIAC HEMODYNAMICS AND HUMAN HEART FUNCTION IN SIMULATED WEIGHTLESSNESS
Ye. B. Shulzhenko, L. I. Kakurin, A. A. Savilov, and A. M. Babin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 72-79 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 32-38 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33141# Joint Publications Research Service, Arlington, Va.
COSMONAUTS' CARDIOVASCULAR SYSTEM FUNCTION DURING LONG-TERM ORBITAL FLIGHTS ABOARD SALYUT-6 STATION
A. D. Yegorov, O. G. Itsekhovskiy, I. V. Turchaninova, A. P. Alferova, A. P. Polyakova, and V. I. Bernadskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 80-88 refs Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 55-61 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33142# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL ANALYSIS OF HEART RHYTHM ASSESSMENT OF DISTINCTIVE FEATURES IN ADAPTATION TO SPACEFLIGHT CONDITIONS
R. M. Bayevskiy, G. A. Nikulina, and I. G. Tazetdinov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 89-98 refs

Transl. into ENGLISH from Vestn. Akad. Med. Nauk SSSR (Moscow), no. 4, Apr. 1984 p 62-69 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33143# Joint Publications Research Service, Arlington, Va.
MECHANISMS OF OSTEODYSTROPHY IN WEIGHTLESSNESS
A. I. Volozhin *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 99-109 refs Transl. into ENGLISH from Patol. Fiziol. i Eksperim. Terapiya (Moscow), no. 1, Jan. - Feb. 1984 p 19-27 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33661# Joint Publications Research Service, Arlington, Va.
SPEECH ANALYSIS SYSTEM FOR ASSESSING PILOTS' WORKING FITNESS Abstract Only
S. Dvigantsev *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 56-57 Transl. into ENGLISH from Med. Gazeta (Moscow), 10 Apr. 1985 p 4 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

N85-33664# Joint Publications Research Service, Arlington, Va.
EFFECTS OF BLOOD VOLUME OVERLOAD ON MYOCARDIAL ULTRASTRUCTURE IN RELATION TO ADAPTATION TO HIGH ALTITUDE HYPOXIA Abstract Only
A. K. Kadyraliyev and A. Yu. Tilis *In its* USSR Rept. Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 103 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 6, Nov. - Dec. 1984 p 36-39 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

N85-33665# Joint Publications Research Service, Arlington, Va.
CARDIORESPIRATORY FUNCTION AND WORK PERFORMANCE DURING ADAPTATION TO INDUSTRIAL LABOR IN MIDALPINE CONDITIONS Abstract Only
B. S. Mambetaliyev and K. U. Akynbekov *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 104 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 10-12 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

N85-33666# Joint Publications Research Service, Arlington, Va.
STRUCTURAL CHANGES IN THYROID DUE TO HIGH-ALTITUDE ADAPTATION IN KIRGHIZIA Abstract Only
V. T. Lyamtsev, Yu. K. Bazumovskiy, M. D. Turgunbayev, and M. O. Bragin *In its* USSR Rept.: Life Sci. (JPRS-UBB-85-018) 28 Jun. 1985 p 104-105 Transl. into ENGLISH from Zdravookhraneniye Kirgizii (Frunze, USSR), no. 1, Jan. - Feb. 1985 p 32-35 (For primary document see N85-33660 22-51)
Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-33669# Joint Publications Research Service, Arlington, Va.
PSYCHOPHYSIOLOGICAL DISTINCTIONS OF ORGANIZATION AND REGULATION OF DAILY CYCLOGRAMS OF CREW ACTIVITIES DURING LONG-TERM SPACECRAFT
A. N. Litsov and V. F. Shevchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 12-18 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 12-16 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

N85-33670# Joint Publications Research Service, Arlington, Va.
OPERATOR'S FUNCTIONAL COMFORT ZONE WHEN CONTROLLING MOVING OBJECT
V. I. Myasnikov, B. N. Ryzhov, and V. P. Salnitskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 19-23 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 17-19 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

N85-33671# Joint Publications Research Service, Arlington, Va.
RAPID DETERMINATION OF CADET DISCIPLINE BY PROJECTIVE TESTS
V. I. Yevdokimov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 2, Mar. - Apr. 1985 (JPRS-USB-85-004) 12 Aug. 1985 p 24-29 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 2, Mar. - Apr. 1985 p 20-23 (For primary document see N85-33667 22-52)
Avail: NTIS HC A07

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-33698 Defence Research Information Centre, Orpington (England).
THERMAL STRESS SUFFERED BY TANK CREWS WORKING IN SUMMER HEAT
G. Kleinhauss, C. Piekarski, G. Schaad, and W. Gorges Mar. 1985 24 p refs Transl. into ENGLISH from Wehrmed. Monatsschr. (West Germany), vol. 3, no. 28, 1984 p 89-98
(DRIC-T-7492; BR95444) Copyright. Avail: NTIS HC A02/MF A01

Air conditioning techniques for tanks including active cooling, isolation measures, and adiabatic moisturizing of the air are compared. The expected efficiency and limits of the systems are illustrated. Compared with the air conditioner, the smaller technical expenditure and lower energy consumption of the water atomizer offers a constructive and logistical alternative under combat conditions. Author (ESA)

N85-33699 Royal Signals and Radar Establishment, Malvern (England).
PERFORMANCE OF ROLLING BALL AND ISOMETRIC JOYSTICK ON A 2-D TARGET ALIGNMENT TASK
A. Jackson Apr. 1984 38 p refs
(RSRE-MEMO-3695; BR95202) Copyright. Avail: NTIS HC A03/MF A01

A rolling ball and a rate controlled isometric joystick were employed in a target alignment task with dimensions comparable with those of many air traffic control (ATC) tasks. Variables included amplitude and target with three levels of control-display relationship (gain), and direction of movement. The two devices were compared on overall performance time, the rate of incorrect responses, adherence to Fitts' law, and directional biases. This last factor proves significant only for the joystick. The rolling ball is recommended for the ATC environment. Control-display relationship has no effect on the performance measures employed.
Author (ESA)

N85-33700# Boeing Commercial Airplane Co., Seattle, Wash. Program Engineering and Maintenance Service.
THE DEVELOPMENT AND EVALUATION OF COLOR DISPLAY SYSTEMS FOR AIRBORNE APPLICATIONS. PHASE 1: FUNDAMENTAL VISUAL, PERCEPTUAL, AND DISPLAY SYSTEM CONSIDERATIONS Final Report, Sep. 1983 - Jul. 1984
Louis D. Silverstein and Robin M. Merrifield 18 Jul. 1985 328 p refs Sponsored in part by Navy

(Contract DTFA01-83-C-20033)
(FAA/PM-85-19; D6-53012) Avail: NTIS HC A15/MF A01

A great number of complex, interacting factors determine the effectiveness of a color display system. Many of these factors characterize visual displays in general, while others are specifically related to the production of use of color. Because it is difficult, if not unwise, to isolate and consider human visual and perceptual factors separately from color display system hardware characteristics, both operator and display system requirements must be analyzed according to common functional units. The objectives of the study were to review the current philosophy and standards on the airborne applications of electronic color display systems, develop guidelines for specifying and measuring color CRT display performance parameters, conduct a survey of currently available color systems, review and evaluate existing system capabilities, and predict future trends and applications in color display systems and componentry. Author

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-33701* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF AND APPARATUS FOR GENERATING AN INTERSTITIAL POINT IN A DATA STREAM HAVING AN EVEN NUMBER OF DATA POINTS Patent
Thomas R. Edwards, inventor (to NASA) Issued 9 Jul. 1985 12 p Filed 29 Oct. 1982 Supersedes N83-12932 (21 - 03, p 0447)
(NASA-Case-MFS-25319-1; US-Patent-4,528,639; US-Patent-Appl-SN-437917; US-Patent-Class-364-723; US-Patent-Class-364-853) Avail: US Patent and Trademark Office CSCL 09B

Apparatus for doubling the data density rate of an analog to digital converter or doubling the data density storage capacity of a memory deviced is discussed. An interstitial data point midway between adjacent data points in a data stream having an even number of equal interval data points is generated by applying a set of predetermined one-dimensional convolute integer coefficients which can include a set of multiplier coefficients and a normalizer coefficient. Interpolator means apply the coefficients to the data points by weighting equally on each side of the center of the even number of equal interval data points to obtain an interstital point value at the center of the data points. A one-dimensional output data set, which is twice as dense as a one-dimensional equal interval input data set, can be generated where the output data set includes interstitial points interdigitated between adjacent data points in the input data set. The method for generating the set of interstital points is a weighted, nearest-neighbor, non-recursive, moving, smoothing averaging technique, equivalent to applying a polynomial regression calculation to the data set.
Official Gazette of the U.S. Patent and Trademark Office

N85-33702*# Maryland Univ., College Park. Space Initiative.
COMPUTER SCIENCE: KEY TO A SPACE PROGRAM RENAISSANCE. THE 1981 NASA/ASEE SUMMER STUDY ON THE USE OF COMPUTER SCIENCE AND TECHNOLOGY IN NASA. VOLUME 2: APPENDICES Final Report
Robert A. Freitas, Jr., ed. and Patricia A. Carlson, ed. 15 Jan. 1983 273 p refs Sponsored by NASA
(NASA-CR-175295; NAS 1.26:175295) Avail: NTIS HC A12/MF A01 CSCL 09B

Adoption of an aggressive computer science research and technology program within NASA will: (1) enable new mission capabilities such as autonomous spacecraft, reliability and self-repair, and low-bandwidth intelligent Earth sensing; (2) lower manpower requirements, especially in the areas of Space Shuttle operations, by making fuller use of control center automation, technical support, and internal utilization of state-of-the-art computer techniques; (3) reduce project costs via improved software verification, software engineering, enhanced scientist/engineer productivity, and increased managerial effectiveness; and (4) significantly improve internal operations within NASA with electronic mail, managerial computer aids, an automated bureaucracy and uniform program operating plans. G.L.C.

N85-33703# Applied Energy Sciences, Inc., Los Angeles, Calif.
A NEW LARGE-SCALE, HIGH-RESOLUTION MULTICOLOR SOFTWARE DISPLAY CONCEPT Final Report, 20 Aug. 1984 - 20 Feb. 1985
J. G. Logan Mar. 1985 180 p
(Contract DACW72-84-C-0013)
(AD-A155404; DSA-DI-S-4057; ETL-0388) Avail: NTIS HC A09/MF A01 CSCL 09/2

Progress in CRT display technology has been limited. Consequently, new technologies are being examined (e.g., solid-state, flat-panel displays) that might be applicable for a large-scale, high resolution, multicolor software display. In this proposal, a new approach to very large screen display technology is suggested, based on the unique piezoelectric properties of stretched polyvinylidene fluoride films. The objective of this Phase 1 program is to demonstrate that individual picture elements can be developed, yielding the necessary gray-scale range, to form the basis for large-screen display and that these elements can also easily be modified to incorporate full-color display. This report provides a summary of the activities carried out during the six-month Phase 1 program to demonstrate that the use of simple bimorph elements to modulate light beams provides a very simple technique for the development of large, flat screen display elements systems. The construction of simple prototype display elements to demonstrate the feasibility of the approach is also described. The potential for the development of inexpensive display systems is suggested. In particular, it is shown that the U.S. Army Engineer Topographic Laboratories' requirement for a large-scale, high-resolution, multicolor software display to proof and display maps and charts can be satisfied using this approach. GRA

N85-33704# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
OPTIMAL BAYESIAN ESTIMATORS FOR IMAGE SEGMENTATION AND SURFACE RECONSTRUCTION
J. L. Marroquin May 1985 18 p
(Contract DAAG29-84-K-0005)
(AD-A155732; LIDS-P-1456; ARO-20980.21-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

A very fruitful approach to the solution of image segmentation and surface reconstruction tasks in their formulation as estimation problems via the use of Markov random field models and Bayes theory. However, the Maximum a Posteriori estimate, which is the one most frequently used, is suboptimal in these cases. This

document shows that for segmentation problems, the optimal Bayesian estimator is the maximizer of the posterior marginals, while for reconstruction tasks, the thresholded posterior mean has the best possible performance. Presented are efficient distributed algorithms for approximating these estimates in the general case. Based on these results, the author develops a maximum likelihood procedure that leads to a parameter-free distributed algorithm for restoring piecewise constant images. To illustrate these ideas, the reconstruction of binary patterns is discussed in detail. GRA

N85-33705# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.
ELECTRONIC FILE SYSTEM ON AN SM 90 MINICOMPUTER: THE SARDE PROJECT Ph.D. Thesis [SYSTEME D'ARCHIVAGE ELECTRONIQUE SUR UN MINI-CALCULATEUR (SM 90): PROJECT SARDE]
Djamshid Tashk 26 Nov. 1984 154 p refs In FRENCH
(ENST-84E018; ISSN-0751-1351) Avail: NTIS HC A08/MF A01

Electronic archiving technology and system design are examined. Numerical optical disk long term memory utilization, interfaces for the SM 90 multiprocessor computer, data compression systems, and user requirements are discussed. One dimensional compression coding computer programs in C language and macroassembler language are given. Practical applications of the system are discussed. The performance is considered acceptable and the retrieval time is excellent. Author (ESA)

N85-33344# Joint Publications Research Service, Arlington, Va.
BASIC FEATURES OF PERSONAL COMPUTERS Abstract Only
Jiri Jan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 23 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 32-37 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33362# Joint Publications Research Service, Arlington, Va.
SYSTEM OF MICROPROCESSOR INSTRUCTIONS Abstract Only
V. Ye. Lokhmatyy and S. N. Trankov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 40 Transl. into ENGLISH from Avtomatika, Telemekhan. i Svyaz (Moscow), no. 5, May 1984 p 18-21 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33380# Joint Publications Research Service, Arlington, Va.
CONFERENCES OF QUANTUM-RADIOOPTICS SECTION Abstract Only
A. N. Mikaelyan and M. M. Koblova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 66 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 93 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33390# Joint Publications Research Service, Arlington, Va.
MODULE FOR INTERFACING MICROPROCESSORS AND MICROCOMPUTER Abstract Only
G. Zelenko, V. Panov, and S. Popov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 10-11 Transl. into ENGLISH from Radio (Moscow), no. 9, Sep. 1983 p 32-35 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33410# Joint Publications Research Service, Arlington, Va.
FILTRATION OF HIGHER HARMONIC COMPONENTS IN TWO-LEVEL DIGITAL COMPUTING SYNTHESIZERS Abstract Only
A. N. Fadeyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 47-48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 29-33 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33411# Joint Publications Research Service, Arlington, Va.
ART OF PROGRAMMING PROGRAMMABLE MICROCALCULATORS, PART 4: ERRORS OF CALCULATIONS Abstract Only
Ya. K. Trokhimenko and F. D. Lyubich *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 48 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 48-53 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-33706# Argonne National Lab., Ill. Mathematics and Computer Science Div.
USE OF MONITORS IN PASCAL ON THE LEMUR: A TUTORIAL ON THE BARRIER, SELF-SCHEDULING FOR-LOOP, AND ASKFOR MONITORS
J. A. Clausing, R. T. Hagstron, E. L. Lusk, and R. A. Overbeek Jul. 1984 49 p refs
(Contract W-31-109-eng-38; Grant NSF MCS-82-07496)
(ANL-84-53) Avail: NTIS HC A03/MF A01

A set of macro libraries has been developed that allows programmers to write portable Pascal code for multiprocessors. This document presents, in tutorial form, the macros used to implement three common synchronization patterns: self-scheduling FOR-loops, barrier synchronization and the askfor monitor. Author

N85-33707# Los Alamos National Lab., N. Mex.
QKPLT USERS GUIDE, VERSION 2.0
R. V. Browning, W. R. Oakes, C. M. Winkler, and Betty Leffler, ed. Aug. 1984 37 p
(Contract W-7405-eng-36)
(L-10094-M) Avail: NTIS HC A03/MF A01

QKPLT is an interactive program used to make graphs and mathematically manipulate experimental or numerical time histories. It can be used to casually peruse and reduce experimental records or it can produce report quality graphs when used with MAPPER. QKPLT is written in FORTRAN, using the Dissipla plotting system. The program is designed for interactive use on Tektronix 4000 series terminals. Author

N85-33708# Research Triangle Inst., Research Triangle Park, N.C.
CARE 3 MENU MAINTENANCE MANUAL
W. F. Ingogly, S. E. McBride, J. L. Pierce, and A. M. Roberts May 1985 46 p
(Contract NAS1-16489)
(NASA-CR-172609; NAS 1.26:172609) Avail: NTIS HC A03/MF A01 CSCL 09B

CARE 3 predicts the unreliability of highly reliable reconfigurable fault-tolerant systems that include multiple digital computers or computer systems. The CARE 3 MENU provides an easy method for creating a file that can be used with the CARE 3 system. This CARE 3 MENU Maintenance Manual provides installation and operation instructions for the CARE 3 MENU program, as well as information needed to customize menus and help files. B.W.

N85-33709# Oregon State Univ., Corvallis. Technical Planning and Development Group.
DECODE: A SOFTWARE MANUAL FOR USE WITH THE SERIAL ASCII INSTRUMENTATION LOOP (SAIL) SYSTEM Engineering Report
J. Wagner and R. S. Mesecar May 1985 100 p
(Contract N00014-84-C-0218)
(AD-A155358; TP/D-85-9) Avail: NTIS HC A05/MF A01 CSCL 09/2

The DECODE is the title of a user-interface computer algorithm which simplifies access to data in an operating Serial ASCII

Instrumentation Loop (SAIL) system. The DECODE has been developed to permit users to scale, label, restructure and, select portions of data in the presence of highly variable data formats. These capabilities permit the user to maintain system application flexibility while minimizing changes to the operating software. The concept also appears useful to a variety of data handling systems requiring a less formal method for gaining user access to data. GRA

N85-33710# General Dynamics/Fort Worth, Tex. Data Systems Div.
INTEGRATED SUPPORT SOFTWARE SYSTEM (ISSS) Final Report, 15 Jun. 1981 - 31 Dec. 1984
H. Conn, F. Reagor, S. Madaras, and H. Ferguson Wright-Patterson AFB, Ohio AFWAL Apr. 1985 37 p
(Contract F33615-81-C-1524)
(AD-A155715; FZM-7218; AFWAL-TR-85-1034) Avail: NTIS HC A03/MF A01 CSCL 09/2

The integrated Support Software System (ISSS) is an integrated software development environment that operates on a Digital Equipment Corporation (DEC) VAX 11/780 computer with the VMS operating system. The ISSS provides a core set of tools for software configuration management, editing, and word processing. Other tools configured for this effort are a J-73 JOVIAL compiler, 1750A tool set, JOVIAL Automated Verification System (J73AVS), Software Design and Documentation Language (SDDL), Automated Report Tracking System (ARTS), Tool Information and Presentation System (TIPS), User System Evaluation and Integration Tool (USE .IT), VAX Downloader to the AN/AYK-15A User Console (LODAYK), and X.25 Network between the VAX 11/780 and the Harris H-800. This system is a collection of integrated software tools utilized in the development of software targeted for Mil-STD-1750A avionic embedded processors. GRA

N85-33711# Stanford Univ., Calif. Systems Optimization Lab.
MODEL BUILDING AND PRACTICAL ASPECTS OF NONLINEAR PROGRAMMING
P. E. Gill, W. Murray, M. A. Saunders, and M. H. Wright Mar. 1985 41 p Presented at the NATO Advanced Study Inst., Bad Windsheim, West Germany, 23 Jul. - 2 Aug. 1984
(Contracts N00014-75-C-0267; DAAG29-84-K-0156; DE-AM03-76F-00326; DE-AT03-76ER-72018)
(AD-A155720; SU-SOL-85-2; ARO-21592.2-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

Many optimization problems arise from complex models of real-world phenomena. This paper examines the close relationship between certain features of well-posed models and robust optimization methods. First, a list of modelling principles is given, to aid in formulating models suited to solution by modern optimization methods. Quasi-Newton sequential quadratic programming methods for nonlinearly constrained optimization are then discussed. The topics considered include representation and definition of the approximate Hessian of the Lagrangian function; similarities between primal and dual quadratic programming methods; treatment of inconsistent and ill-conditioned subproblems; and properties of various active-set strategies. Finally, the results of solving several test problems are analyzed in detail, including significant characteristics of the overall solution process such as superlinear convergence. Author (GRA)

N85-33712# Sandia Labs., Albuquerque, N. Mex.
AUTSKED: AN ADDENDUM
D. W. Sasser Apr. 1985 70 p
(Contract DE-AC04-76DP-00789)
(DE85-010410; SAND-83-2583/2-Add) Avail: NTIS HC A04/MF A01

Modifications to AUTSKED, the automated scheduling technique for leaching and filling activities at the Strategic Petroleum Reserve are documented. These user-desired modifications grew out of user experience with AUTSKED and were deemed to be important in improving the utility of AUTSKED. DOE

N85-33713# Oak Ridge National Lab., Tenn.
DATA BASE WORKSHOP: AVAILABILITY-RELIABILITY MODELING
D. C. Keeton 1985 23 p Workshop held in Rockville, Md., 28 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-011570; CONF-8503138-1) Avail: NTIS HC A02/MF A01

A mathematical model for nuclear power reactor reliability and failure analysis was evaluated. Available generic data was used to demonstrate and evaluate the model through computerized simulation. G.L.C.

N85-33714# Sandia Labs., Albuquerque, N. Mex.
SANCHO: A FINITE ELEMENT COMPUTER PROGRAM FOR THE QUASISTATIC, LARGE DEFORMATION, INELASTIC RESPONSE OF TWO-DIMENSIONAL SOLIDS
C. M. Stone, R. D. Krieg, and Z. E. Beisinger Apr. 1985 102 p refs
(Contract DE-AC04-76DP-00789)
(DE85-011456; SAND-84-2618) Avail: NTIS HC A06/MF A01

SANCHO is a finite element computer program designed to compute the quasistatic, large deformation, inelastic response of planar or axisymmetric solids. Finite strain constitutive theories for plasticity, volumetric plasticity, and metallic creep behavior are included. A constant bulk strain, bilinear displacement isoparametric finite element is employed for the spatial discretization. The solution strategy used to generate the sequence of equilibrium solutions is a self-adaptive dynamic relaxation scheme which is based on explicit central difference pseudo-time integration and artificial damping. A master-slave algorithm for sliding interfaces is also implemented. A theoretical development of the appropriate governing equations and a description of the numerical algorithms are presented along with a user's guide which includes several sample problems and their solution. DOE

N85-33715# Sandia Labs., Albuquerque, N. Mex.
SURFACE WAVE MODES OF A MULTILAYERED MEDIUM BACKED BY A PERFECTLY CONDUCTING GROUND PLANE: COMPUTATION OF PROPAGATION CONSTANTS
W. A. Johnson Mar. 1985 78 p refs
(Contract DE-AC04-76DP-00789)
(DE85-011454; SAND-85-0276) Avail: NTIS HC A05/MF A01

Surface wave modes provide a mechanism for propagation of electromagnetic energy parallel to the surface of a multilayered medium, backed by a perfect electric conductor. The problem is made tractable by restricting the surfaces of the layers and the conductor to planes of infinite extent. The surface waves are determined by complex poles of the reflection coefficient. A numerical technique is developed to compute these complex poles from which the surface propagation constants immediately follow. Numerical results are given only for the first surface wave pole that appears above cutoff. The effects on the lossy propagation constants of placing thin, lossy dielectric and magnetic layers at various locations within a dielectric layer are studied as a function of frequency. DOE

N85-33716# Sandia Labs., Livermore, Calif.
IGES/RIM PARSER/CONVERTER USERS GUIDE
R. E. Isler May 1985 61 p
(Contract DE-AC04-76DR-00789)
(DE85-011965; SAND-85-8219) Avail: NTIS HC A04/MF A01

Sandia National Laboratories has been assigned Lead Lab responsibility by the Department of Energy (DOE) for integrating the communications among computer aided design/computer aided manufacturing (CAD/CAM) activities throughout DOE's Nuclear Weapons Complex (NWC). A primary objective is to provide a capability for the exchange of digital data between dissimilar CAD systems within the NWC. A subset of the Initial Graphics Exchange specification (IGES) will be the data exchange format. The IGES/RIM Parser/Converter is the first in a series of programs being developed within the NWC to carry out this automated exchange. The Parser/Converter program converts an IGES file

into a file of input commands to a Relational Information Manager (RIM) database. DOE

N85-33717# Oak Ridge National Lab., Tenn.
PARALLEL CHOLESKY FACTORIZATION IN MESSAGE-PASSING MULTIPROCESSOR ENVIRONMENTS
M. T. Heath May 1985 22 p
(Contract DE-AC05-84OR-21400)
(DE85-012079; ORNL-6150) Avail: NTIS HC A02/MF A01

Parallel algorithms are presented for computing the Cholesky factorization on multiprocessors having only private local memory. Synchronization of multiple processes is based on message passing. Several possible processor interconnection networks are considered. DOE

N85-33718# Oak Ridge National Lab., Tenn.
MORSE-CGA: A MONTE CARLO RADIATION TRANSPORT CODE WITH ARRAY GEOMETRY CAPABILITY
M. B. Emmett Apr. 1985 29 p
(Contract DE-AC05-84OR-21400)
(DE85-012063; ORNL-6174) Avail: NTIS HC A03/MF A01

The MORSE-CG computer code system has been revised to add a new geometry module MARS, which is the combinatorial geometry package that allows multiple arrays for specifying geometries. The new code system is known as MORSE-CG where CGA indicates Combinatorial Geometry Array. The PICTURE code, which makes printer plots of 2-D slices through a combinatorial geometry mock-up, has also been revised to handle the MARS array capability. The changes required in MORSE-CG and in PICTURE are documented. DOE

N85-33719# Los Alamos National Lab., N. Mex.
DETERMINATION OF DTL CONFIGURATIONS
R. A. Tennant and J. D. Schneider 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-010714; LA-UR-85-1253; CONF-850504-22) Avail: NTIS HC A02/MF A01

A computer code (DLT) has been developed for quickly designing and evaluating different drift-tube linac (DLC) configurations. Inputs to the code include the power losses on reference DTL components determined previously by a computer code such as SUPERFISH. The scaling parameters for the new DTL configuration are beta (particle velocity), accelerating gradient, synchronous phase angle, transit-time factor, and the number of cells per DTL tank. Resulting calculations determine cell size, RF power losses, beam energy, and DTL length of the new configuration. A complete new configuration can be generated in a few seconds on an Apple 2 computer. Accuracy of this code is within 1% of the more sophisticated code PARMILA. DOE

N85-33720# Stanford Linear Accelerator Center, Calif.
PORTABLE DATABASE DRIVEN CONTROL SYSTEM FOR SPEAR
S. Howry, T. Gromme, A. King, and M. Sullenberger Apr. 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-010465; SU-SLAC-PUB-3618; CONF-850504-15) Avail: NTIS HC A02/MF A01

The new computer control system software for SPEAR is presented as a transfer from the PEP system. Features of the target ring (SPEAR) such as symmetries, magnet groupings, etc., are all contained in a design file which is read by both people and computer. People use it as documentation; a program reads it to generate the database structure, which becomes the center of communication for all the software. Geometric information, such as element positions and lengths, and CAMAC I/O routing information is entered into the database as it is developed. Since application processes refer only to the database and since they do so only in generic terms, almost all of this software (representing more then fifteen man years) is transferred with few changes. Operator console menus (touchpanels) are also transferred with only superficial changes for the same reasons. The system is modular: the CAMAC I/O software is all in one process: the menu control software is a process; the ring optics model and the orbit model are separate processes, each of the which runs concurrently with about 15 others in the multiprogramming environment of the VAX/VMS operating system. DOE

N85-33721# Sandia Labs., Albuquerque, N. Mex.
USER COMMANDS FOR PRODUCT DESIGN AND SYSTEM MANAGEMENT
N. J. Nelson 1985 20 p Presented at the 10th Ann. Meeting of the Applicon Users Group., Phoenix, Ariz., 19 May 1985
(Contract DE-AC04-76DP-00789)
(DE85-011708; SAND-85-0780C; CONF-8505140-1) Avail: NTIS HC A02/MF A01

IMAGE user commands that were developed to aid in system management tasks and to assist the Computer-Aided Design System (CADS) user in various phases of product design through better utilization of resources are discussed. Specific topics include system aids such as backup by data, automated mass properties calculation and retention, and data verification. DOE

N85-33722# Los Alamos Scientific Lab., N. Mex.
KIVA COMPUTER PROGRAM FOR MULTIDIMENSIONAL CHEMICALLY REACTIVE FLUID FLOWS WITH FUEL SPRAYS
P. J. ORourke 1985 17 p Presented at Symp. on Numerical Simulation on Combust. Phenomena, Sophia-Antipolis, France, 21 May 1985
(Contract W-7405-eng-36)
(DE85-012730; LA-UR-85-1728; CONF-8505150-1) Avail: NTIS HC A02/MF A01

The capabilities of the KIVA computer program are presented. It was written to calculate both two and three dimensional chemically reactive fluid flows. KIVA solves by finite difference techniques the unsteady equations for a multicomponent, chemically reactive mixture ofideal gases, together with those for an evaporating liquid spray. Although it was written with applications to internal combustion engine research in mind, with modification KIVA can be applied to a variety of other combustion and two-pahse flow problems. The differences between KIVA and the well-known CONCRAS-SPRAY computer program are emphasized and some advantages and disadvantages of the numerical methodology in KIVA are given. The capabilities of the program are illustrated by describing the results of numerical test problems. DOE

N85-33723# California Univ., Livermore. Lawrence Livermore Lab.
FLAT IS NOT NECESSARILY GOOD
D. J. Balaban and D. O. Neison 17 Apr. 1985 8 p
(Contract W-7405-eng-48)
(DE85-012819; UCID-20422) Avail: NTIS HC A02/MF A01

The disciplines of software engineering and expert system building seem very different from each other. The software engineer describes a system in terms of its interactions with a simplified version of the world around it. The expert system builder, on the other hand, describes a system in terms of knowledge acquired from an available expert and strategies for exploiting that knowledge. In fact, this perceived difference is due in large part to a difference in the complexity of the world being modeled. The relationship between these two disciplines are explored and means by which new AI techniques can be directly used to extend software engineering methodologies without also importing deficiencies inherent in rule based expert systems are described. DOE

N85-33724# California Univ., Livermore. Lawrence Livermore Lab.
SMACS: A SYSTEM OF COMPUTER PROGRAMS FOR PROBABILISTIC SEISMIC ANALYSIS OF STRUCTURES AND SUBSYSTEMS. VOLUME 1: USER'S MANUAL
O. R. Maslenikov, J. J. Johnson, L. W. Tiong, M. J. Mraz, S. Bumpus, and M. A. Gerhard Mar. 1985 110 p
(Contract W-7405-eng-48)

(DE85-011853; UCID-20413-Vol-1) Avail: NTIS HC A06/MF A01

The SMACS (Seismic Methodology Analysis Chain with Statistics) system of computer programs, one of the major computational tools of the Seismic Safety Margins Research Program (SSMHP), links the seismic input with the calculation of soil structure interaction, major structure response, and subsystem response. The seismic input is defined by ensembles of acceleration time histories in three orthogonal directions. Soil structure interaction and detailed structural response are then determined simultaneously, using the substructure approach to SSI as implemented in the CLASSI family of computer programs. The modus operandi of SMACS is to perform repeated deterministic analyses, each analysis simulating an earthquake occurrence. Parameter values for each simulation are sampled from assumed probability distributions according to a Latin hypercube experimental design. The user may specify values of the coefficients of variation (COV) for the distributions of the input variables. The computer program SMAX performs the repeated SSI response calculations for major structure and subsystem response. DOE

N85-33725# Sandia Labs., Albuquerque, N. Mex.
PMEXA: DIAGNOSTIC FILTERING PROGRAM FOR THE PBFA-1 PERFORMANCE MONITORING AND EVALUATION SYSTEM
A. R. Phillips and J. P. VanDevender May 1985 84 p
(Contract DE-AC04-76DP-00789)
(DE85-013179; SAND-84-1654) Avail: NTIS HC A05/MF A01

An automatic analysis program PMEXA has been developed to analyze and correlate the data on many particle beam fusion accelerator (PBFA 1) shots to determine the random timing variations, the systematic dependences of components on the operation of the previous stages, and the deviations of major components from normal operation. As an example, the analysis can uncover performance deviations of 1 to 2 ns out of data dominated by typically 3 ns standard deviation jitter, 3 ns standard deviation component defects, and 25% flow through timing variations from previous stages. The defects are identified for operations personnel to investigate and, hence, the program filters the number of events that require attention. DOE

N85-33726# Sandia Labs., Albuquerque, N. Mex.
EXPERIMENTS AND IMPROVEMENTS OF THE ORDINARY DIFFERENTIAL EQUATION SOLVERS DEPAC ON THE CRAY COMPUTER
H. A. Watts May 1985 32 p
(Contract DE-AC04-76DP-00789)
(DE85-013260; SAND-85-0856) Avail: NTIS HC A03/MF A01

An attempt has been made to improve timing results for solving large systems of differential equations using DEPAC on the CRAY computer. By reprogramming some critical (previously nonvectorized) loops, using loop unrolling where appropriate, and using the CRAY $SCRILIB routines, significant speedup factors have been achieved. Cost reduction factors of 2 to 7 when compared to the unmodified DEPAC codes have been observed. Three additional user options which enable faster execution in appropriate circumstances have been incorporated. The modified DEPAC will replace the earlier package as part of the SLATEC library for use on the CRAY. The computational results produced are identical to those obtained by the earlier codes. DOE

N85-33727# Rockwell International Corp., Golden, Colo.
HOW A BASIC PROGRAM WORKS
[1985] 10 p
(DE85-009142; RFP-3785) Avail: NTIS HC A02/MF A01

Very brief notes for a lecture on programming in BASIC are provided. A listing of a demonstration program is included. DOE

N85-33728# Bettis Atomic Power Lab., West Mifflin, Pa.
AUTOMATIC CAPABILITY TO STORE AND RETRIEVE COMPONENT DATA AND TO CALCULATE STRUCTURAL INTEGRITY OF THESE COMPONENTS
C. J. McKinnis and P. M. Toor Jan. 1985 15 p
(Contract DE-AC11-76PN-00014)
(DE85-012429; WAPD-T-2851) Avail: NTIS HC A02/MF A01

In structural analysis, assimilation of material, geometry, and service history input parameters is very cumbersome. To overcome the difficulties, a computer program was developed to provide the capability to establish a computerized library of all material, geometry, and service history parameters for components. The program has the capability to calculate the structural integrity based on the Arthenius type equations, including the probability calculations. This unique combination of computerized input information storage and automated analysis procedure assures consistency, efficiency, and accuracy when the hardware integrity has to be reassessed. DOE

N85-33729# KMS Fusion, Inc., Ann Arbor, Mich.
SEARCH OF THE VAXIntosh CUSTOMIZING VMS V4.0 FOR DCL WINDOWS
J. G. Downward 1985 14 p Presented at the Spring DECUS Symp., New Orleans, 27 May 1985
(Contract DE-AC08-82DP-40152)
(DE85-011306; CONF-8505131-2) Avail: NTIS HC A02/MF A01

Methods of implementing windows for: (1) DCL and MAIL; (2) command procedures; and (3) the VMS V4.0 editors EDT, LSE and TPU are described. While VMS and a number of utilities have the SPAWN command available to the user, the window interface to be described is found to be simpler to use because windows are consistently invoked with a single key command, and confusion is minimized because it is always known if one is in a window. DOE

N85-33730# Fondazione Ugo Bordoni, Rome (Italy).
AN ALGORITHM FOR THE GENERATION OF PRIMITIVE POLYNOMIALS [UN ALGORITMO PER LA GENERAZIONE DI POLINOMI PRIMITIVI]
Emilio Montolivo Sep. 1984 24 p refs In ITALIAN Sponsored by Amministrazione Poste e Telecomunicazioni
(FUB-17-1984) Avail: NTIS HC A02/MF A01

The generation of pseudo random binary sequences for cryptographic application is discussed. The so-called linear generators are characterized by a polynomial which determines the period of the sequence produced. A procedure to verify if a characteristic polynomial is primitive is presented. The method requires an 8 bit microprocessor and is intended as a code generator in telesurveillance systems. Author (ESA)

N85-33731# Institut Franco-Allemand de Recherches, St. Louis (France).
NUMERICAL SIMULATION OF INTERIOR AND TERMINAL BALLISTICS PHENOMENA. INVESTIGATION OF THE EFFECTS OF THE PARAMETERS AND APPLICATION EXAMPLES Final Report [NUMERISCHE SIMULATION INNEN- UND ENDBALLISTISCHER VORGAENGE UNTERSUCHUNG VON PARAMETEREINFLUESSEN UND ANWENDUNGSBEISPIELE]
R. Hunkler and G. Paulus 29 Jun. 1984 31 p refs In GERMAN
(Contract BMVg-T/R-760/C-0002/C-1702)
(ISL-R-112/84) Avail: NTIS HC A03/MF A01

Crushing under perpendicular incidence of cylindrical projectiles made of materials, interesting from the terminal ballistics point of view was simulated using the finite element code program for the Elastoplastic Simulation of Impacts (PEPSI). Shock waves produced by the impact and the resulting loading of the projectile were examined. The results of the calculation code strongly depend on the physical models taken as basic hypotheses and on the specific parameters of the program. The strengthening models and the chosen grid analysis structure play an important role. A large number of calculations are performed and evaluated to estimate the effect of these parameters. The PEPSI code is extended to describe noncylindrical projectiles. This extension makes it possible to determine the loading of a heavy metal projectile at the discharge of the gun. Author (ESA)

N85-33336# Joint Publications Research Service, Arlington, Va.
HIGH-SPEED ADAPTATION ALGORITHM FOR HARMONIC CORRECTOR Abstract Only

V. S. Mikhalchan *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 18 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 41-44 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33340# Joint Publications Research Service, Arlington, Va.
HARDWARE REALIZATION OF DIGITAL FILTERS WITHOUT MULTIPLIERS Abstract Only
A. V. Brunchenko, Yu. S. Vlasyuk, and A. A. Ignatyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 20 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 83-86 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33341# Joint Publications Research Service, Arlington, Va.
DESIGN OF HIGH-ORDER ANALOG AND DIGITAL FILTERS WITH IDENTICAL SECTIONS Abstract Only
Yu. A. Grebenko, N. N. Savkov, and A. A. Semkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 21 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 87-90 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33342# Joint Publications Research Service, Arlington, Va.
STATE OF ART AND DEVELOPMENT PROBLEMS IN COMPUTER-AIDED DESIGN OF ELECTRONIC CIRCUITS Abstract Only
V. N. Ilin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 21-22 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 7-17 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33343# Joint Publications Research Service, Arlington, Va.
MODELING OF ELECTRONIC CIRCUITS WITH HIGH DEGREE OF COMPONENT INTEGRATION Abstract Only
V. T. Frolkin, Ye. M. Tikhomirova, and V. G. Moshnyaga *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 22-23 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 17-31 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33347# Joint Publications Research Service, Arlington, Va.
ALGORITHMS AND ORGANIZATION OF SOFTWARE FOR COMPUTER-AIDED CIRCUIT DESIGN Abstract Only
I. P. Norenkov, V. A. Martynyuk, V. A. Trudonoshin, and V. G. Fedoruk *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 25 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 71-77 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33348# Joint Publications Research Service, Arlington, Va.
ART OF PROGRAMMING PROGRAMMABLE MICROCALCULATORS: CALCULATION OF RESPONSE FROM CURRENT VALUES OF ACTION Abstract Only
Ya. K. Trokhimenko *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 26 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 78-84 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33349# Joint Publications Research Service, Arlington, Va.
COMPUTER SIMULATION OF INTEGRATED INJECTION LOGIC Abstract Only
O. M. Mikhaylova and K. O. Petrosyants *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 26-27 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 85-86 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33350# Joint Publications Research Service, Arlington, Va.
NUMERICAL SIMULATION OF NONISOTHERMAL TRANSIENT PROCESSES IN GaAs DIODE STRUCTURES Abstract Only
E. E. Velmre and B. P. Freydin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 27 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 86-88 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33351# Joint Publications Research Service, Arlington, Va.
MODELING OF DISCRETE DEVICES WITH USE OF MULTIVALUED LOGIC AND NOMOGRAMS Abstract Only
A. A. Molchanov, S. M. Makarov, and Kh. Telot *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 28 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 88-89 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33352# Joint Publications Research Service, Arlington, Va.
SOFTWARE FOR FREQUENCY ANALYSIS OF MICROWAVE CIRCUITS Abstract Only
L. M. Karpukov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 28 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 94-95 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33353# Joint Publications Research Service, Arlington, Va.
SYSTEM FOR COMPUTER-AIDED DESIGN OF ANALOG ELECTRONIC CIRCUITS Abstract Only
Ya. K. Trokhimenko, V. K. Lovkiy, N. I. Yastrebov, and N. V. Grebenkov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 29 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 95-96 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33354# Joint Publications Research Service, Arlington, Va.
OPTIMIZATION OF RADIOELECTRONIC CIRCUITS WITH SOFTWARE FOR MODELING OF INTEGRATED CIRCUITS ON UNIFIED SYSTEM COMPUTER Abstract Only
L. Z. Katsnelson, Ye. S. Kelman, and L. S. Pokhvalina *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 29-30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 97-98 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33355# Joint Publications Research Service, Arlington, Va.
DIALOG SYSTEM WITH MINICOMPUTER FOR PLOTTING PERFORMANCE CHARTS Abstract Only
S. P. Nosikov and V. T. Frolkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 30 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 99-100 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33356# Joint Publications Research Service, Arlington, Va.
ALGORITHMS FOR CONSTRUCTING MODELS OF CIRCUIT ELEMENTS IN INPUT LANGUAGE OF COMPUTER-AIDED DESIGN SOFTWARE Abstract Only
V. L. Kogan, V. L. Uskov, and A. S. Belotserkovskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 30-31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 100-102 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33357# Joint Publications Research Service, Arlington, Va.
ALGORITHM FOR DETERMINATION OF ISOMORPHIC GRAPHS Abstract Only
Ye. N. Ruzayev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 31 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 102-103 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33408# Joint Publications Research Service, Arlington, Va.
SYNTHESIS OF TESTS FOR PROGRAMMABLE LOGIC ARRAYS Abstract Only
A. Ye. Lyulkin and T. G. Pavlova *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 46 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 299-305 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33409# Joint Publications Research Service, Arlington, Va.
DETECTION OF AND SEARCH FOR FAULTS IN PROGRAMMABLE LOGIC ARRAYS Abstract Only
M. B. Volynskiy and V. G. Novoselov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 47 Transl. into ENGLISH from Mikroelectron. (Moscow), v. 12, no. 4, Jul. - Aug. 1983 p 306-312 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N85-33732*# Michigan Univ., Ann Arbor.
MODELING AND MEASUREMENT OF FAULT-TOLERANT MULTIPROCESSORS Final Report
Kang G. Shin, Michael H. Woodbury, and Yann-Hang Lee Washington Aug. 1985 63 p refs
(Grants NAG1-296; NAG1-492; NGT-23-005-801)
(NASA-CR-3920; NAS 1.26:3920) Avail: NTIS HC A04/MF A01 CSCL 09B

The workload effects on computer performance are addressed first for a highly reliable unibus multiprocessor used in real-time control. As an approach to studing these effects, a modified Stochastic Petri Net (SPN) is used to describe the synchronous operation of the multiprocessor system. From this model the vital components affecting performance can be determined. However, because of the complexity in solving the modified SPN, a simpler model, i.e., a closed priority queuing network, is constructed that represents the same critical aspects. The use of this model for a specific application requires the partitioning of the workload into job classes. It is shown that the steady state solution of the queuing model directly produces useful results. The use of this model in evaluating an existing system, the Fault Tolerant Multiprocessor (FTMP) at the NASA AIRLAB, is outlined with some experimental results. Also addressed is the technique of measuring fault latency, an important microscopic system parameter. Most related works have assumed no or a negligible fault latency and then performed approximate analyses. To eliminate this deficiency, a new methodology for indirectly measuring fault latency is presented. B.W.

N85-33733# SRI International Corp., Menlo Park, Calif.
RESEARCH ON DISTRIBUTED ARTIFICIAL INTELLIGENCE Final Report, 1 Feb. 1980 - 1 Jan. 1985
K. Konolige Apr. 1985 113 p
(Contract N00014-80-C-0296)
(AD-A155356) Avail: NTIS HC A06/MF A01 CSCL 09/4

The goal of the DAI project is to provide fundamental research into the principles upon which a network of intelligent, cooperative computer agents can be based. The motivation for such distributed systems arises when we consider problem domains with the following characteristics: (1) The environment is naturally partitioned, either spatially or functionally. An example of the former is a surveillance task in which several different areas must be patrolled; of the latter, assembly tasks in which major subcomponents can be assembled in parallel; (2) Each process' view of the environment is dynamic: other processes may be performing tasks, and chains of events may result from ongoing natural processes; (3) Each process has partial or imperfect knowledge of the environment; and (4) The cost of communication among processes may be high or the communication channels may be slow so that there is a significant delay in sending large amounts of information. GRA

N85-33734# Eidgenoessische Technische Hochschule, Zurich (Switzerland).
[REPORT OF WORKSHOP ON COMPUTATIONAL GEOMETRY AND SUMMARY OF RELATED RESEARCH] Final Report
J. Nievergelt Apr. 1985 5 p Workshop held in Karlsruhe, West Germany, 28-29 Mar. 1985
(Contract DAJA37-82-C-0058)
(AD-A155399) Avail: NTIS HC A02/MF A01 CSCL 09/2

This document presents abstracts of papers presented at a workshop and which pertain to the following fields: (1) grid file data management system; (2) prolog interpreter; (3) sweep algorithms for geometrical data processing; (4) modula-2 compiler for motorola 68000; (5) application-independent dialog control of interactive systems; (6) interactive educational demonstration programs; and (7) software packages. GRA

N85-33735# Department of the Air Force, Washington, D.C.
MICROCOMPUTER CONTROLLED IMAGE PROCESSOR Patent Application
R. A. Carreras, inventor (to Air Force) Filed 8 Jan. 1985 31 p
(AD-D011734; US-Patent-Appl-SN-689700) Avail: NTIS HC A03/MF A01 CSCL 09/2

The microcomputer controlled image processor receives an interference pattern of samples of pairs of transmitted laser beams from a charge couple device (CCD) camera. This invention calculates an optical path difference (OPD) between each pair of beams using: an analog amplifier; an analog-to-digital (A/D) converter; a multiple accumulator controller; a programmable read-only-memory (PROM); a microcomputer; and a read-only-memory. The analog amplifier and A/D converter amplify and convert to digital the interference pattern received from the CCD camera. The multiple accumulator controller (MAC) receives the digital camera signal from the A/D converter, and adds correction factors for the non-linearities in the CCD camera. The PROM stores these correction factors, and supplies these to the MAC when needed. The random access memory (RAM) receives and stores the corrected data from the MAC and supplies the data to the microcomputer. The microcomputer receives the corrected digital interference pattern from the RAM and applies two algorithms to the data to yield estimates of the OPD between the two sampled laser beams. The OPD is a measure of adjustment in the optical path lengths of the two sampled laser beams. When its OPD value is supplied to the laser transmitter, a correcting means can adjust the length of the optical paths of one or both of the samples laser beams to bring them in phase with each other. GRA

N85-33736# Sandia Labs., Albuquerque, N. Mex.
INTEGRATION OF OFFICE AUTOMATION WITHIN COMPUTING
1985 19 p Presented at the DOE Conf. on Office Automation, Albuquerque, N. Mex., 24 Apr. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010021; SAND-85-0925C; CONF-8504129-1) Avail: NTIS HC A02/MF A01

An informal talk is given that focuses on the coupling between office automation efforts and the traditional fields of computing, particularly management information systems. DOE

N85-33737# Florida Univ., Gainesville. Database Systems Research and Development Center.

LOGICAL AND PHYSICAL MODELING AND DESIGN OF SCIENTIFIC AND STATISTICAL DATABASES FOR ENERGY RESEARCH Final Technical Report, 1 Jul. 1981 - 31 May 1984
S. Y. W. Su, S. B. Navathe, and D. S. Batory 1984 42 p
(Contract DE-AS05-81ER-10977)
(DE85-006081; DOE/ER-10977/T7) Avail: NTIS HC A03/MF A01

Research is summarized in these areas: semantic modeling and language design; complex data types; database mapping and integration; physical design; and parallel algorithms and database machines. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N85-33738*# Science Applications Research, Lanham, Md.
A STRATEGY PLANNER FOR NASA ROBOTICS APPLICATIONS
Steven S. Brodd 24 Jul. 1985 52 p refs
(Contract NAS5-28200)
(NASA-CR-175319; NAS 1.26:175319; Rept-85B0504) Avail: NTIS HC A04/MF A01 CSCL 09B

Automatic strategy or task planning is an important element of robotics systems. A strategy planner under development at Goddard Space Flight Center automatically produces robot plans for assembly, disassembly, or repair of NASA spacecraft from computer aided design descriptions of the individual parts of the spacecraft. Author

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-33739# California Univ., Livermore. Lawrence Livermore Lab.
SOME IDEAS FOR DECOMPOSING THE DOMAIN OF ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS IN THE SCHWARZ PROCESS
G. Rodrique Mar. 1985 12 p refs Presented at the Symp. on Algorithms, Architectures and the Future of Sci. Computation, Austin, Tex., 18 Mar. 1985
(Contract W-7405-eng-48)
(DE85-011844; UCRL-92480; CONF-8503129-2) Avail: NTIS HC A02/MF A01

Simulations have shown that one of the major breakdowns in the efficiency of a multiprocessing computing system is over communication between the computer modules. Experiments on the CRAY XMP/2 seem to corroborate these predictions. Consequently, in designing numerical methods for multiprocessors, algorithms are sought that can be partitioned so that communication between the algorithmic tasks is minimized. In scientific calculations, this communication amounts to the passing of numerical data that mathematically couple the individual scientific processes. Thus, the goal in multiprocessing scientific calculations is to define individual scientific processes that are weakly coupled to one another. Many partial differential equations have an inherent potential for multiprocessing in the domain of dependence of the independent variables. To illustrate, the numerical solution of the partial differential equation: partial u/partial t = F(x, u, t, D/sub x/u, D/sub x/(2)u, ...) is considered. DOE

N85-33740# Illinois Univ., Urbana. Dept. of Computer Science.
IMPLEMENTING LINEAR MULTISTEP FORMULAS FOR SOLVING DAES
G. K. Gipta, C. W. Gear, and B. Leimkuhler Apr. 1985 36 p refs
(Contract DE-AC02-76ER-02383)
(DE85-012400; IU-UIUCDCS-R-85-1205; IU-UILU-ENG-85-1709; COO-2383-01107) Avail: NTIS HC A03/MF A01

The organization of an automatic code for differential-algebraic equations is discussed. The proposed code can handle a large class of problems of index no greater than two. DOE

N85-33741# Institut Franco-Allemand de Recherches, St. Louis (France).
PRESENTATION OF NUMERICAL SIMULATION WORK IN TERMINAL BALLISTICS USING A FEW EXAMPLES. APPLICATIONS OF THE CALCULATION MODEL PROGRAM FOR ELASTOPLASTIC SIMULATION OF IMPACTS (PEPSI) OF THE FRANCO-GERMAN RESEARCH INSTITUTE SAINT LOUIS (ISL) [DARSTELLUNG DER SIMULTANIONSARBEITEN ZUR ENDBALLISTIK ANHAND AUSGESUCHTER BEISPIELE. ANWENDUNGEN DES ISL-RECHENMODELLS PEPSI]
R. Hunkler and G. Paulus 6 Jun. 1984 23 p ref In GERMAN Original contains color illustrations
(ISL-CO-209/84) Avail: NTIS HC A02/MF A01

Simulation of the crushing by a rigid target of a projectile consisting of an homogeneous rod and a projectile consisting of a multielement rod, and the penetration of a heavy metal homogeneous rod by an elastoplastic model are described. It is clear that the application domain of the model is only substantially extended after the installation of new computer at ISL. In particular the deformation of the target could be examined. Author (ESA)

N85-33358# Joint Publications Research Service, Arlington, Va.
METHOD OF ESTIMATING CONVERGENCE OF HAAR COEFFICIENTS IN MESSAGE COMPRESSION PROBLEMS Abstract Only
Yu. V. Sobolev, P. F. Polyakov, and V. G. Ivanov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 31-32 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33359# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF SENSITIVITY FUNCTIONS FOR DISCRETE DYNAMIC SYSTEMS FROM RESULTS OF FUNCTION MODELING ON DIGITAL COMPUTER Abstract Only
Ye. I. Glushankov, V. V. Davydenko, and V. M. Terentyev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 32 Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved.: Radioelektron. (Kiev), v. 27, no. 6, Jun. 1984 p 105-106 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33400# Joint Publications Research Service, Arlington, Va.
GENERALIZATION OF DISCRETE FOURIER TRANSFORMATION FOR INTERPOLATION IN TIME DOMAIN Abstract Only
V. A. Ponomarev and O. V. Ponomareva *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 33 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 67-69 Previously announced in IAA as A84-10221 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-33742# Los Alamos National Lab., N. Mex.
MONTE CARLO LEARNING-BIASING EXPERIMENT WITH INTELLIGENT RANDOM NUMBERS
T. E. Booth 1985 36 p refs Presented at the Joint Los Alamos-CEA Meeting on Monte Carlo Methods, Cadarache, France, 22 Apr. 1985
(Contract W-7405-eng-36)
(DE85-010713; LA-UR-85-1255; CONF-8504110-19) Avail: NTIS

HC A03/MF A01

A Monte Carlo learning and biasing technique is described that does its learning and biasing in the random number space rather than the physical phase space. The technique is probably applicable to all linear Monte Carlo problems, but no proof is provided here. Instead, the technique is illustrated with a simple Monte Carlo transport problem. Problems encountered, problems solved, and speculations about future progress are discussed. DOE

N85-33743# Los Alamos National Lab., N. Mex.
IMPLICIT MONTE CARLO METHODS AND NON-EQUILIBRIUM MARSHAK WAVE RADIATIVE TRANSPORT
J. E. Lynch 1985 11 p refs Presented at the Joint Los Alamos-CEA Meeting on Monte Carlo Methods, Cadarache, France, 22 Apr. 1985
(Contract W-7405-eng-36)
(DE85-010711; LA-UR-85-1261; CONF-8504110-14) Avail: NTIS HC A02/MF A01

Two enhancements to the Fleck implicit Monte Carlo method for radiative transport are described, for use in transparent and opaque media respectively. The first introduces a spectral mean cross section, which applies to pseudoscattering in transparent regions with a high frequency incident spectrum. The second provides a simple Monte Carlo random walk method for opaque regions, without the need for a supplementary diffusion equation formulation. A time-dependent transport Marshak wave problem of radiative transfer, in which a non-equilibrium condition exists between the radiation and material energy fields, is then solved. These results are compared to published benchmark solutions and to new discrete ordinate S-N results, for both spatially integrated radiation-material energies versus time and to new spatially dependent temperature profiles. Multigroup opacities, which are independent of both temperature and frequency, are used in addition to a material specific heat which is proportional to the cube of the temperature. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-33744# Bremen Univ., (West Germany). Forschungsschwerpunkt Dynamische Systeme.
DECENTRALIZED CONTROL OF DYNAMICALLY INTERCONNECTED SYSTEMS
Arno Linnemann Nov. 1983 12 p refs
(BU-111) Avail: NTIS HC A02/MF A01

Interconnected systems, where the subsystems are interconnected by some dynamic interaction system, are considered. It is shown that this type of system can be stabilized by decentralized dynamic output feedback, if the subsystems are stabilized by (centralized) dynamic output feedback and the interaction system is stable. The relation to previous results is discussed. Author

N85-33745*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FORMULATION AND ANALYSIS OF COMBAT GAMES
Michael Heymann (Technion-Israel Inst. of Tech., Haifa), Mark D. Ardema, and Narayanaswami Rajan (Stanford Univ., Calif.) Jun. 1985 44 p refs
(NASA-TP-2487; ; Rept-85022; NAS 1.60:2487) Avail: NTIS HC A03/MF A01 CSCL 12B

Combat is formulated as a dynamical encounter between two opponents, each of whom has offensive capabilities and objectives. With each opponent is associated a target in the event space in which he endeavors to terminate the combat, thereby winning. If the combat terminates in both target sets simultaneously or in neither, a joint capture or a draw, respectively, is said to occur. Resolution of the encounter is formulated as a combat game; namely, as a pair of competing event-constrained differential games. If exactly one of the players can win, the optimal strategies are determined from a resulting constrained zero-sum differential game. Otherwise the optimal strategies are computed from a resulting non-zero-sum game. Since optimal combat strategies frequencies may not exist, approximate of delta-combat games are also formulated leading to approximate or delta-optimal strategies. To illustrate combat games, an example, called the turret game, is considered. This game may be thought of as a highly simplified model of air combat, yet it is sufficiently complex to exhibit a rich variety of combat behavior, much of which is not found in pursuit-evasion games. Author

N85-33746# Fondazione Ugo Bordoni, Rome (Italy).
SOME PLANT LOCATION PROBLEMS [ALCUNI PROBLEMI DI LOCALIZZAZIONE DI IMPIANTY]
Giancarlo Pesamosca Jan. 1984 19 p refs In ITALIAN Sponsored by Amministrazione Poste e Telecomunicazioni
(FUB-14-1984) Avail: NTIS HC A02/MF A01

Plant location problems that can be applied to the determination of computer network parameters are reviewed. A complete analytical solution is given for a particular problem. The numerical procedure is based on the steepest descent method. The algorithm is described. Author (ESA)

N85-33371# Joint Publications Research Service, Arlington, Va.
ANALYSIS OF SOLUTION OF BLOCH'S EQUATIONS IN TIME DOMAIN Abstract Only
Yu. K. Levin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 55 Transl. into ENGLISH from Radiotekhn. i Elektron. (Moscow), v. 29, no. 7, Jul. 1984 p 1417-1420 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33422# Joint Publications Research Service, Arlington, Va.
CALCULATING DOMINANT (QUASI-t) MODE GROUP VELOCITY IN SHIELDED MICROSTRIP LINE Abstract Only
K. K. Valuyev, Yu. A. Ilarionov, and V. Ya. Smorgonskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 57 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Aug. 1983 p 70-72 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N85-33747*# Texas Univ., Austin. Center for Aeronautical Research.
A MODAL PARAMETER EXTRACTION PROCEDURE APPLICABLE TO LINEAR TIME-INVARIANT DYNAMIC SYSTEMS
Andrew J. Kurdila and Roy R. Craig, Jr. May 1985 97 p refs
(Contract NAS8-35338)
(NASA-CR-176120; NAS 1.26:176120; CAR-85-2) Avail: NTIS HC A05/MF A01 CSCL 12A

Modal analysis has emerged as a valuable tool in many phases of the engineering design process. Complex vibration and acoustic problems in new designs can often be remedied through use of the method. Moreover, the technique has been used to enhance the conceptual understanding of structures by serving to verify analytical models. A new modal parameter estimation procedure is presented. The technique is applicable to linear, time-invariant systems and accommodates multiple input excitations. In order to provide a background for the derivation of the method, some modal parameter extraction procedures currently in use are described. Key features implemented in the new technique are elaborated upon. G.L.C.

N85-33748# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
SOME PROPERTIES OF LOEB-SOBOLEV SPACES
Leif Arkeryd and Joeran Bergh 1985 25 p refs
(CTH-Math-1985-01; ISSN-0347-2809) Avail: NTIS

HC A02/MF A01

Sobolev spaces type based on the Loeb integral (Loeb-Sobolev space) are considered. Loeb-Sobolev spaces are interesting to study differential and variational equation problems. Trace theorem for Loeb-Sobolev spaces is shown. Fourier multiplier theorem (two versions) on Loeb-Sobolev spaces is proved. Author (ESA)

N85-33749# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
HARDY SPACES AND THE L SUP P-NEUMANN PROBLEM FOR LAPLACE'S EQUATION IN A LIPSCHITZ DOMAIN
Bjoern E. J. Dahlberg and Carlos E. Kenig (Minnesota University, Minneapolis) 1985 32 p refs
(CTH-Math-1985-02; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Neuman's problem in Lipschitz domain with data in L sup p is solved. The method of estimating the maximal function of gradients of solutions using regularity theory and the integral equation method are used. The Fredholm theory is not completely applicable. Author (ESA)

N85-33750# Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Mathematics.
ADMISSIBLE CONVERGENCE OF POISSON INTEGRALS IN SYMMETRIC SPACES
Peter Sjoegren 1985 36 p refs
(CTH-Math-1985-04; ISSN-0347-2809) Avail: NTIS HC A03/MF A01

Furstenberg-Satake compactification (FSC) on Riemann symmetric space is considered. Korany's modes convergence (unrestricted and restricted nontangential convergence) on p-integrable functions on compact boundaries of FSC are studied. Admissible convergence is related to maximal function estimates. Author (ESA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-33751# Danish Meteorological Inst., Copenhagen.
ABSOLUTE MEASUREMENT OF DECLINATION (D) BY MEANS OF A PROTON MAGNETOMETER
E. KringLauridsen 1984 18 p refs
(DMI-Geophys-Papers-R-68; ISBN-87-7478-222-3) Avail: NTIS HC A02/MF A01

A compensation method using stationary coils to measure declination (D) is outlined. In a large coil with vertical axis the current is adjusted so that Z = 0. A smaller coil with four sets of cylindrical turns is placed with its axis horizontal. This D-coil is provided with a telescope pointing at a mark nearly in the magnetic meridian. A proton magnetometer sensor is placed in the common center of the coils. Two series of readings are taken with the D-coil in erect and inverted position respectively. Variations of D, H, F and D-coil current are recorded. A simple formula gives the mean value of D. Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N85-33752 National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
A THEORETICAL APPRAISAL OF THE USE OF GROUND-PLANE MICROPHONES FOR AIRCRAFT NOISE MEASUREMENTS
R. C. Payne and G. F. Miller Dec. 1984 38 p refs
(NPL-AC-103; ISSN-0143-7143) Copyright. Avail: Issuing Activity

It is demonstrated theoretically that the use of a ground-plane microphone arrangement for aircraft noise measurements successfully removes the effects of constructive and destructive interference which occur with the conventional 1.2 m high microphone location. The arrangement recommended consists of a 0.4 m diameter hard, rigid baffle placed flush with the surrounding ground. The microphone should be offset from the center of the baffle by three-quarters of the baffle radius and mounted in such away that a line drawn from it to the center of the baffle is perpendicular to the projected line of aircraft flight. The importance of ensuring a flush baffle placement is stressed, the baffle should be recessed into the ground. Measurement performance depends on the shape of the noise spectrum (including tonal content) and on the angle of sound incidence. Author (ESA)

N85-33753# Johns Hopkins Univ., Baltimore, Md. Dept. of Materials Science and Engineering.
HETERODYNE HOLOGRAPHIC INTERFEROMETRY FOR VISUALIZATION OF SURFACE ACOUSTIC WAVES Interim Technical Report
J. W. Wagner Nov. 1984 114 p
(Contract N00014-82-K-0741; Proj. RR0-1108)
(AD-A155405; ONR-85-1) Avail: NTIS HC A06/MF A01 CSCL 14/5

A technique for recording and visualizing acoustic wavefronts over a finite field of view and with a resolution on the order of Angstroms has been developed. Multiple exposure holograms of an aluminum test block were used to record the surface displacements resulting from the detonation of a small explosive charge placed on the object surface. The primary wavefronts resulting from the explosive charge were sufficiently large as to be visible upon reconstruction of the holographic interferograms. In addition, details of the surface wavefronts which could not be deduced using conventional holographic interferometry were measured and displayed by modifying the pulsed recording geometry and subsequently applying heterodyne interferometric analysis to the holograms to interpolate between the observed interferometric fringes. Although theory predicts that still greater resolution is possible, fringe interpolation to 1/900 of a fringe (about 2A displacement) was demonstrated. Based on these experimental results and the mathematical relationships which have been developed to describe system performance, it appears likely that a practical system for studying sub-Angstrom transient phenomena may be realized using heterodyne holographic interferometry. Author (GRA)

N85-33430# Joint Publications Research Service, Arlington, Va.
BINARY SIGNAL DETECTION IN ACOUSTOOPTIC RECEIVERS
A. V. Pugovkin *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 65-68 refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, 1983 p 75-77 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33431# Joint Publications Research Service, Arlington, Va.
ASYMMETRY OF DIFFRACTION ORDERS WITH LIGHT DIFFRACTION AT SURFACE ACOUSTIC WAVE Abstract Only
V. B. Voloshinov, V. N. Parygin, and N. S. Tankovski *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 69 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 8, Sep. 1983 p 38-42 Previously announced in IAA as A83-45681 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-33754 Defence Research Information Centre, Orpington (England).

NMR IN THE 80 S: NEW NUCLEI, NEW PULSES
H. Guenther and P. Schmitt Mar. 1985 28 p refs Transl into ENGLISH from Naturwiss. (West Germany), v. 71 1984 p 342-352
(DRIC-T-7467; BR95442) Copyright. Avail: NTIS HC A03/MF A01

Experimental advances in nuclear magnetic resonance (NMR) spectroscopic techniques are described. The NMR spectroscopy of rare nuclei, and two-dimensional methods are considered. The examples: NMR measurements for iron-57, chromium-53 and nitrogen-15, and experimental techniques such as polarization transfer. The J-resolved two-dimensional NMR spectra, two dimensional shift correlations, and multiquantum phenomena are discussed. Applications and basic physical principles of these techniques are evaluated. Author (ESA)

N85-33755# Brookhaven National Lab., Upton, N. Y. Dept. of Chemistry.
PHOTOIONIZATION OF ALKALI AND ALKALINE EARTH ATOMS: Na AND Mg
Jack M. Preses, C. E. Burkhardt (Missouri Univ., St. Louis), R. L. Corey (Missouri Univ., St. Louis), D. L. Earsom (Missouri Univ., St. Louis), T. L. Daulton (Missouri Univ., St. Louis), W. P. Garver (Missouri Univ., St. Louis), J. J. Leventhal (Missouri Univ., St. Louis), A. Z. Msezane (Atlanta Univ.), and S. T. Manson (Georgia State Univ., Atlanta) 1985 6 p refs Presented at the Conf. on Autoionization of Atoms and Small Molecules, Argonne, Ill., 2-3 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-011812; BNL-36406; CONF-850560-2) Avail: NTIS HC A02/MF A01

Determinations of the photoionization cross sections of ground state magnesium atoms and excited state sodium atoms have been made over a wide wavelength range. The ground state measurement in magnesium was performed using synchrotron radiation from the UV ring at the National Synchrotron Light Source. Several autoionizing resonances were observed. The photoionization cross section of excited sodium atoms was determined by irradiating laser-produced Na(3p) with synchrotron light. In both cases, agreement with theory is excellent. DOE

N85-33756# National Science Foundation, Washington, D.C. Div. of Physics.
INTERACTING BOSON APPROXIMATION
S. P. Rosen 1984 49 p Prepared in cooperation with Purdue Univ., Lafayette, Ind.
(Contract DE-AS05-76ER-05126)
(DE85-003016; DOE/ER-05126/183; ORO-5126-183) Avail: NTIS HC A03/MF A01

Lecture notes on the Interacting Boson Approximation are given. Topics include: angular momentum tensors; properties of T(sub i) sup (n) matrices; T(sub i)(sup (n) matrices as Clebsch-Gordan coefficients; construction of higher rank tensors; normalization: trace of products of two s-rank tensors; completeness relation; algebra of U (N); eigenvalue of the guadratic Casimir operator for U(3); general result for U(N); angular momentum content of U(3) representation; p-Boson model; Hamiltonian; quadrupole transitions; S,P Boson model; expectation value of dipole operator; S-D model; U(6); quadratic Casimir operator; an O(5) subgroup; an O(6) subgroup; properties of O(5) representations; quadratic Casimir operator; quadratic Casimir operator for U(6); decomposition via SU(5) chain; a special O(3) decomposition of SU(3); useful identities; a useful property of D(sub (ALPHA) (BETA) (GAMMA)) (ALPHA), (BETA), (GAMMA) = 4-8) as coupling coefficients; explicit construction of T(sub x)(sup (2)) and d(sub (ALPHA (BETA) (GAMMA)); D-coefficients; eigenstates of T3; and summary of T = 2 states. DOE

N85-33757# Los Alamos Scientific Lab., N. Mex.
THE cw OPERATION OF THE FMIT RFQ ACCELERATOR
W. D. Cornelius 1985 7 p refs Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012667; LA-UR-85-1610; CONF-850504-46) Avail: NTIS HC A02/MF A01

Reliable CW operation of the Fusion Materials Irradiation Test (FMIT) radio frequency quadrupole (RFQ) accelerator was achieved. In addition to the operational experiences in achieving this status, some of the modifications of the vacuum system, cooling system, and RF structure are discussed. Preliminary beam characterization results are presented. DOE

N85-33758# Los Alamos Scientific Lab., N. Mex.
TRANSVERSE EMITTANCE OF A 2.0-MeV RFQ BEAM WITH HIGH BRIGHTNESS
O. R. Sander, G. P. Boicourt, and W. B. Cottingame 1985 4 p refs Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012718; LA-UR-85-1682; CONF-850504-86) Avail: NTIS HC A02/MF A01

One major purpose of the accelerator test stand (ATS) is to see if particle simulation codes can currently predict the output beam parameters of the radio frequency quadrupole (RFQ) linac. By injecting a very bright 100 keV beam (100 mA, 0.02 (PI) x cm x mrad) and comparing the measured output beam parameters with those predicted (using PARMTEQ), PARMTEQ's performance in a high space charge regime is investigated. PARMTEQ has successfully simulated the RFQ beam transmission and energy distribution; it is more difficult to simulate output transverse emittance. Transverse emittance is also difficult to measure because of the high power density beam. Special modification of the interceptive slit and collector equipment was required. Measured transverse emittances are compared with those predicted. DOE

N85-33759# Sandia Labs., Albuquerque, N. Mex.
SUPERMITE VACUUM INTERFACE DESIGN
W. B. Moore, R. W. Stinnett, and D. H. McDaniel 1985 12 p Presented at the 5th IEEE Pulsed Power Conf., Washington, D.C., 10 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-012861; SAND-84-2559C; CONF-850616-11) Avail: NTIS HC A02/MF A01

A new water plastic vacuum interface has been designed for Sandia Laboratory's Supermite (2.8 MV, 2.2 ohm) accelerator. This design was based on the PBFA I vacuum interface. Electrostatic field plots show that in positive polarity the water feed to the PBFA I interface will fail at 2 MV on Supermite. This is confirmed by positive polarity experiments and field plots using the PBFA I style vacuum interface at the Naval Research Labs. Modifications to the water section geometry to increase the water breakdown strength in positive polarity result in equivalent electric field grading at the plastic vacuum interface but allow positive polarity operation at voltages up to 3.1 MV. This is accomplished by incorporating a dielectric field shaper which significantly improves the electric field grading across the insulator. DOE

N85-33760# Los Alamos Scientific Lab., N. Mex.
Rf PROGRAM FOR LAMPF 2
E. P. Colton 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, Canada, 13 May 1985
(Contract W-7405-eng-36)
(DE85-012693; LA-UR-85-1526; CONF-850504-120) Avail: NTIS HC A02/MF A01

The RF program is chosen to maintain a bucket/bunch area ratio of at least two during RF capture, acceleration, injection, and extraction. At 0.797 GeV the beam bunch area is 0.0635 eVs. We show the behavior of the rms bunch length and dp/p during acceleration. The RF system must provide a voltage of 1.59 MV/turn for the booster and 5.0 MV/turn for the main ring. DOE

N85-33761# Brookhaven National Lab., Upton, N. Y.
SATURATION OF A LONGITUDINAL INSTABILITY DUE TO NONLINEARITY OF THE WAKE FIELD

S. Krinsky 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, Canada, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-012514; BNL-36430; CONF-850504-82) Avail: NTIS HC A02/MF A01

Self sustained synchrotron oscillations are observed in electron storage rings. In general the theoretical description of the saturation of an instability for large oscillation amplitude is a difficult problem, and techniques have not yet been developed which yield analytic approximations to the appropriate nonlinear Vlasov or Fokker-Planck equations. A single point bunch interacting with the wake field from a single resonant mode of an RF cavity is considered, and the averaging method of Bogoliubov and Mitropolsky is used to study the saturation of the initial exponential growth of the oscillation amplitude, due to the nonlinearity of the wake field. The determination of the limiting amplitude of oscillation is discussed both in the presence and in the absence of radiation damping. DOE

N85-33762# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Reaktorsicherheit.
MULTIPLE COLLISION SOLUTIONS FOR TIME-DEPENDENT NEUTRON TRANSPORT IN SLABS OF FINITE THICKNESS
Peter Windhofer Jan. 1985 39 p refs
(OEFZS-4312; RS-247/85) Avail: NTIS HC A03/MF A01

Multiple collision solutions of the time, space, and angle dependent neutron transport equation in slab geometry are given. Two monodirectional sources were used: a delta (t)-shaped pulse of neutrons (delta (t) = Dirac delta distribution) impinging on the slab at time t = 0; and a rectangular source, emitting neutrons for a time interval delta t, describing a more realistic situation. Detailed results up to collision order three are discussed. The scalar flux of one times scattered neutrons for the slab problem is independent of space in the region influenced by the slab boundaries. Author (ESA)

N85-33763# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
DOES LOW-ENERGY PHYSICS DEPEND ON THE POTENTIAL OF A HEAVY HIGGS-PARTICLE
J. J. vanderBij Jan. 1985 13 p refs
(NIKHEF-H/85-1; B8562882) Avail: NTIS HC A02/MF A01

The two-loop corrections to vector boson propagators and vertices are calculated in the limit of large Higgs-mass for a model with one Higgs-doublet but arbitrary gauge-invariant potential. The corrections are finite even for a non-renormalizable potential. By a suitable choice of the phi to the sixth power term in the potential the corrections due to the Higgs self-coupling are cancelled. Author (ESA)

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-33764# Department of Energy, Washington, D. C.
POLARIZATION OF FAST PARTICLE BEAMS BY COLLISIONAL PUMPING Patent Application
J. Warren Stearns, Selig N. Kaplan, Robert V. Pyle, L. Wilmer Anderson, Lawrence Ruby, and Alfred S. Schlachter, inventors (to DOE) Filed 19 Oct. 1984 24 p
(Contract DE-AC03-76SF-00098)
(DE85-011621; US-Patent-Appl-SN-662655) Avail: NTIS HC A02/MF A01 CSCL 18K

The invention relates to method and apparatus for polarizing a fast beam of particles by collisional pumping, including generating a fast beam of particles, and generating a thick electron-spin-polarized medium positioned as a target for said beam, said medium being sufficiently thick to allow said beam to interact with said medium to produce collisional pumping whereby said particle beam becomes highly polarized. DOE

N85-33765# Department of Energy, Washington, D. C.
CORROSION RESISTANT STORAGE CONTAINER FOR RADIOACTIVE MATERIAL Patent Application
D. G. Schweitzer, inventor (to DOE) (Brookhaven Lab.) and M. S. Davis Filed 30 Aug. 1984 38 p
(Contract DE-AC02-76CH-00016)
(DE85-011666; US-Patent-Appl-SN-645652) Avail: NTIS HC A03/MF A01 CSCL 18F

A corrosion resistant long-term storage container for isolating high-level radioactive waste material in a repository is claimed. The container is formed of a plurality of sealed corrosion resistant canisters of different relative sizes, with the smaller canisters housed within the larger canisters, and with spacer means disposed between juxtaposed pairs of canisters to maintain a predetermined spacing between each of the canisters. The combination of the plural surfaces of the canisters and the associated spacer means is effective to make the container capable of resisting corrosion, and thereby of preventing waste material from leaking from the innermost canister into the ambient atmosphere. DOE

N85-33766# Department of Energy, Washington, D. C.
MEASUREMENT OF RADIONUCLIDES IN WASTE PACKAGES Patent Application
R. L. Brodzinski (Pacific Northwest Lab.), R. W. Perkins (Pacific Northwest Lab.), H. G. Rieck (Pacific Northwest Lab.), and N. A. Wogman, inventor (to DOE) (Pacific Northwest Lab.) Filed 12 Sep. 1984 8 p
(Contract DE-AC06-76RL-01830)
(DE85-011674; US-Patent-Appl-SN-649625) Avail: NTIS HC A02/MF A01 CSCL 18G

A method is described for nondestructively assaying the radionuclide content of solid waste in a sealed container by analysis of the waste's gamma-ray spectrum and neutron emissions. Some radionuclides are measured by characteristic photopeaks in the gamma-ray spectrum; transuranic nuclides are measured by neutron emission rate; other radionuclides are measured by correlation with those already measured. DOE

N85-33767# Department of Energy, Washington, D. C.
REDUCTION OF REABSORPTION EFFECTS IN SCINTILLATORS BY EMPLOYING SOLUTES WITH LARGE STOKES SHIFTS Patent Application
L. A. Harrah (Sandia Labs., Albuquerque, N. Mex.) and C. L. Renschler, inventor (to DOE) (Sandia National Labs., Albuquerque, N. Mex.) Filed 1 Aug. 1984 26 p
(Contract DE-AC04-76DP-00789)
(DE85-011645; US-Patent-Appl-SN-636655) Avail: NTIS HC A03/MF A01 CSCL 18K

A radiation or high energy particle responsive system useful as a scintillator comprises, a first component which interacts with radiation or high energy particles to emit photons in a certain first wavelength range, and at least one additional solute component which absorbs the photons in said first wavelength range and thereupon emits photons in another wavelength range higher than said first range. An improvement is provided wherein at least one of said components absorbs substantially no photons in the wavelength range in which it emits photons, due to a large Stokes shift caused by an excited state intramolecular rearrangement. DOE

N85-33768# California Univ., Livermore. Lawrence Livermore Lab.
BIBLIOGRAPHY AND INDEX FOR NUCLEAR REACTIONS AMONG LIGHT CHARGED PARTICLES, VOLUME 26
S. T. Perkins, A. M. Hansen, and R. J. Howerton Sep. 1984 9 p
(Contract W-7405-eng-48)
(DE85-011482; UCRL-50400-Vol-26) Avail: NTIS HC A02/MF A01

A bibliography and index of experimental data from light charged particle induced nuclear reactions has been developed

by searching the literature. To reduce both bulk and expense, this information is presented in the form of microfiche. Such data are useful for charged particle cross section evaluations and transport calculations. The incident particles considered were the five light isotopes p, d, t, (3)He, and (ALPHA). The criterion for including a reference was that the reference contain information about, at least, one reaction induced by an ion of one of the five light isotopes impinging on a target nucleus lighter than (12)C. Once a reference was selected all reactions for target nuclei with Z less than or equal to 17 were included. A further criterion for selection was that the incident particle energy be less than or equal to 20 MeV. DOE

N85-33769# California Univ., Livermore. Lawrence Livermore Lab.
MATERIALS CHARACTERIZATION WITH INTENSE POSITRON BEAMS
I. J. Rosenberg, R. H. Howell, M. J. Fluss, and P. Meyer Apr. 1985 7 p refs Presented at the 2nd Mater. Res. Soc. Spring Meeting, San Francisco, 15-18 Apr. 1985
(Contract W-7405-eng-48)
(DE85-011850; UCRL-91724; CONF-850421-7) Avail: NTIS HC A02/MF A01

An apparatus that provides a high flux, low energy, monoenergetic positron beam to investigate various processes which occur when a positron beam impinges on a metal surface, including annihilation at the surface, trapping in vacancies, and the emission of both fast and thermally desorbed positronium is described. The first angular correlation of annihilation gamma-rays measurements and positronium time of flight experiments at a material surface are reported. A simple free electron model was applied which explains the general trend of the data but differences due to the surface specific properties and the deviation from a free electron metal are evident. DOE

N85-33770# Argonne National Lab., Ill.
SCIENTIFIC OPPORTUNITIES WITH ADVANCED FACILITIES FOR NEUTRON SCATTERING
G. H. Lander and V. J. Emery 1984 213 p refs Workshop held at Shelter Island, N.Y., 23-26 Oct. 1984 Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contracts W-31-109-eng-38; DE-AC02-76CH-00016; W-7405-eng-36; DE-AC05-84OR-21400)
(DE85-012113; CONF-8410256) Avail: NTIS HC A10/MF A01

Deliberations of a large group of experts in neutron scattering and fundamental physics on the need for new neutron sources of greater intensity and more sophisticated instrumentation than those currently available are related. An additional aspect of the Workshop was a comparison between steady-state (reactor) and pulsed (spallation) sources. The main conclusions were: (1) the case for a new higher flux neutron source is extremely strong and such a facility will lead to qualitatively new advances in condensed matter science and fundamental physics; (2) to a large extent the future needs of the scientific community could be met with either a 5 x 10(15) n cm(-2)s(-1) steady state source or a 10(17) n cm(-2)s(-1) peak flux spallation source; and (3) the findings of this Workshop are consistent with the recommendations of the Major Materials Facilities Committee. DOE

N85-33771# RE/SPEC, Inc., Rapid City, S. Dak.
DESIGN ANALYSIS FOR A REPOSITORY IN CRYSTALLINE ROCK
J. L. Ratigan, M. C. Loken, K. M. Linde, and R. A. Wagner Mar. 1985 280 p refs
(Contract DE-AC02-83CH-10139)
(DE85-011802; BMI/OCRD-20) Avail: NTIS HC A13/MF A01

The results of preliminary design analyses of repositories in crystalline rock using three different waste emplacement concepts are presented. Design parameter variations and potential site to site variations in rock properties and conditions are investigated with respect to repository performance. The objective is: (1) to define the rock properties and initial conditions whose site to site variations have a significant effect on repository performance, and (2) to evaluate the effect of repository system design parameters on repository performance. Within the range of anticipated variations in rock properties and conditions, repository interim performance constraints can generally be satisfied by appropriate design. However, not all constraints, as presently established, may be satisfied if: (1) the rock properties or initial conditions at a specific site are at the extreme end of the ranges used in the analyses, and (2) design parameters are maintained within the ranges used in this analysis. When all of the interim performance constraints are considered, none of the waste emplacement concepts exhibits an advantage over another with respect to maximization of allowable gross thermal loading. DOE

N85-33772# Mound Lab., Miamisburg, Ohio.
NUCLEAR MAGNETIC RESONANCE STUDY OF THE INTRAMOLECULAR REARRANGEMENT OF 2-(5-CYANOTETRAZOLATO)PENTAAMMINE COBALT (III) PERCHLORATE
Albert Attalla and E. Margaret Pitre 1985 5 p refs Presented at the ADPA Meeting, Hilton Head, S.C., 11 Mar. 1985
(Contract DE-AC04-76DP-000453)
(DE85-010810; CONF-8503100-6) Avail: NTIS HC A02/MF A01

The intramolecular rearrangement of 2-[5-cyanotetrazolato] pentaammine cobalt (III) perchlorate (CP) to form the amidine chelate perchlorate coordination complex was investigated by variable-temperature high-resolution proton nuclear magnetic resonance (NMR) spectroscopy. Using a concentration of 30 wt% CP in perdeuterodimethylsulfoxide [(CD3]2SO], the rate of formation of the amidine chelate was determined at five different temperatures (60, 70, 80, and 100 C). The logarithm of the specific rate constant at each temperature was plotted as a function of the reciprocal absolute temperature to arrive at the activation energy, E sub a (19.5 kcal/mole), for the rearrangement process. DOE

N85-33773# Los Alamos National Lab., N. Mex.
PROCEEDINGS OF THE 18TH LAMPF USERS GROUP MEETING
J. N. Bradbury, comp. Mar. 1985 201 p Proc. held at Los Alamos, N. Mex., 29 Oct. 1984
(Contract W-7405-eng-36)
(DE85-011888; LA-10370-C; CONF-8410246) Avail: NTIS HC A10/MF A01

The Eighteenth Annual Los Alamos Meson Phyiscs Facility LAMPF Users Group Meeting was held October 29-30, 1984, at the Clinton P. Anderson Meson Physics Facility. The program included a number of invited talks on various aspects of nuclear and particle physics as well as status reports on LAMPF and discussions of upgrade options. The LAMPF working groups met and discussed plans for the secondary beam lines, experimental programs, and computing facilities. DOE

N85-33774# Department of Energy, Washington, D. C. Office of Civilian Radioactive Waste Management.
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT Annual Report to Congress
May 1985 41 p
(DE85-012585; DOE/RW-0004/1) Avail: NTIS HC A03/MF A01

Research over the past 30 years has shown that high level radioactive waste and spent nuclear fuel can be safely disposed of in geologic repositories. An overview is provided of the OCRWM organization. The specific accomplishments of the Office are presented. The Office's financial statements for fiscal years 1983 and 1984 are included, and a concluding chapter updates the report with a brief summary of key accomplishments since the end of fiscal year 1984. DOE

N85-33775# Los Alamos Scientific Lab., N. Mex.
NUCLEAR PHYSICS IN THE 10 TO 300 MeV ENERGY RANGE USING A PULSED WHITE NEUTRON SOURCE
C. D. Bowman, S. a. Wender, and G. F. Auchampaugh 1984 17 p Topical Conf. on Neutron-Neutron Collisions: A Probe of Nucl. Struct., Glouster, Ohio, 5 Sep. 1984

(Contract W-7405-eng-36)
(DE85-003713; LA-UR-84-3506; CONF-840945-11) Avail: NTIS HC A02/MF A01

A new pulsed white neutron source is under construction at the Los Alamos WNR facility. The neutrons are produced by LAMPF proton micropulses striking thick targets of various materials. Beam parameters include energy of 800 MeV, pulse rate of approximately 50,000 Hz, 0.4 nsec pulse width, average current as high as 6(MU)a, and a useful neutron energy range from 3 to 300 MeV. The facility will receive beam approximately 80% of the time LAMPF is operational; it increased by a factor of 1000 the experimental capability over the present system at the WNR when beam intensity, angular distribution, and availability are taken into account. In addition to established white source techniques, the facility is also highly competitive with monoenergetic sources for a wide class of experiments such as neutron capture (GAMMA) ray spectroscopy and neutron-induced charged particle reactions. The facility should be operational in about nine months. Arrangements are underway to make the facility readily accessible to visiting experimenters. DOE

N85-33776# Oak Ridge National Lab., Tenn.
MONTE CARLO AND DISCRETE ORDINATES CALCULATIONS OF 14-MeV NETURONS STREAMING THROUGH A STAINLESS-STEEL DUCT (L/D = 4.6): COMPARISON WITH EXPERIMENT
R. T. Santoro, J. M. Barnes, R. G. Alsmiller, Jr., and J. D. Drischler 1985 2 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-011423; CONF-850310-91) Avail: NTIS HC A02/MF A01

Integral experiments are being carried out at the Oak Ridge National Laboratory to measure neutron and gamma-ray energy spectra from approx. 14 Mev neutrons streaming through cylindrical ducts imbedded in concrete. These data are being used to validate radiation transport code and nuclear data libraries that are being used to calculate nuclear streaming through the penetrations that are found in fusion reactor blanket and shield assemblies. Measured and calculated neutron and gamma-ray energy spectra from approx. 14 MeV neutrons streaming through a stainless-steel duct having a length-to-dia ratio of 4.6 are compared as a function of detector location relative to the mouth of the duct. The length of the duct is 1.45 m. DOE

N85-33777# Brookhaven National Lab., Upton, N. Y.
ACCELERATION OF POLARIZED H(-) IN THE BNL 200 MeV LINAC
Y. Makdisi, R. Witkover, J. Alessi, H. Brown, D. Barton, and A. Kponou 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-011836; BNL-36429; CONF-850504-28) Avail: NTIS HC A02/MF A01

The AGS Polarized Beam Project was started in 1980. The first beam was accelerated in March 1984, followed by commissioning studies and a high energy physics run at 16.5 GeV at an average 30% polarization. The Linac portion of the project included a new polarized H(-) ion source and a Radio-Frequency Quadrupole (RFQ). These are described, as well as the design of the new Low Energy Beam Transport (LEBT) line and beam instrumentation for the linac. Operational results, current status and future plans are discussed. DOE

N85-33778# Brookhaven National Lab., Upton, N. Y.
ULTRAHIGH VACUUM SYSTEM OF THE HEAVY ION TRANSPORT LINE AT BROOKHAVEN
H. C. Hseuh, I. Feigenbaum, M. Manni, P. Stattel, and R. Skelton 1985 4 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-011838; BNL-36453; CONF-850504-29) Avail: NTIS HC A02/MF A01

Heavy ions with an energy up to 8 MeV/A for S(+16) and 1 MeV/A for Au(+34) from the 16 MV Tandem will be injected into the AGS for further acceleration to less than or equal to 15 GeV/A. A 600-meter beam transport line between the Tandem and the AGS has been designed and is under construction. The design of the vacuum system of this transport line and the performance of the prototype vacuum sectors are described. DOE

N85-33779# California Univ., Berkeley. Lawrence Berkeley Lab.
ADVANCED INSTRUMENTATION FOR POSITRON EMISSION TOMOGRAPHY
S. E. Derenzo and T. F. Budinger Apr. 1985 21 p refs Presented at the NATO Advanced Study Inst. on Phys. and Eng. of Med. Imaging, Maratea, Italy, 24 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-011147; LBL-19435; CONF-8409164-2) Avail: NTIS HC A02/MF A01

The physical processes and medical science goals that underly modern instrumentation design for Positron Emission Tomography are summarized. The paper discusses design factors such as detector material, crystalphototube coupling, shielding geometry, sampling motion, electronics design and time-of-flight are discussed. The interrelationships with quantitative accuracy, spatial resolution, temporal resolution, maximum data rates, and cost are also discussed. DOE

N85-33780# Los Alamos Scientific Lab., N. Mex.
NEUTRON DETECTOR COUNTING CAPABILITIES FOR (10)B-LINED AND (235)U FISSION CHAMBERS IN HIGH GAMMA-RAY FLUXES
L. O. Lindquist and E. J. Dowdy Mar. 1985 26 p refs
(Contract W-7405-eng-36)
(DE85-011893; LA-10376-MS) Avail: NTIS HC A03/MF A01

This report compares the performance characteristics of (10)B-lined and fission-neutron detectors in gamma-ray fluxes typical of the fields to be encountered during nondestructive testing of irradiated light-water fuel assemblies stored in water. Using the optimum time constants for each of the (10)B-lined detectors, the 0.25-in.-dia detector had a 5% loss in neutron count sensitivity at 7000 rad/h. Similarly, the 0.5-in.-dia detector had a 7% loss at 13,000 rad/h and the 1-in.-dia detector had a 5% loss in sensitivity at 1000 rad/h. Uranium-235 fission chambers were operated successfully in fields above 100,000 rad/h with no loss in neutron counting sensitivity. Shielding calculations were done to determine the appropriate shield thickness needed for a (10)B-lined neutron detector to operate in a 50,000 rad/h field, typical of light-water-reactor spent-fuel assemblies stored in water. DOE

N85-33781# Los Alamos Scientific Lab., N. Mex.
LONG-TERM EXPOSURE OF (238)PuO2 TO A TERRESTRIAL ENVIRONMENT, VOLUME 3
R. C. Heaton, J. H. Patterson, F. J. Steinkruger, and K. P. Coffelt Feb. 1985 22 p
(Contract W-7405-eng-36)
(DE85-011896; LA-9487-MS-Vol-3) Avail: NTIS HC A02/MF A01

A plutonium oxide source consisting of a single piece of 83% (238)PuO2 and weighing 38 q was exposed for 2.9 years to a humid, temperate terrestrial environment in an environmental simulation chamber. The soil tray of the chamber was divided into four compartments so that different soil types could be studied under identical conditions. Soils examined in this experiment included loam, silt loam, sand, and humus. Plutonium released into the soils, the soil drainages, and the condensates from the dehumidifier was monitored throughout the experiment. The total plutonium release rate from the PuO2 source was approximately 2 ng/sq m/s. The generation of short-ranged airborne plutonium, able to travel from a few centimeters to half a meter, was one of the most significant release pathways. The amount of plutonium released in this way was 10 times that washed directly off the source by rainwater and 20 times that from the fully airborne (longer ranged) release. Of the 200 (MU)q of plutonium deposited in the soils, less than 0.1 (MU)g was released into the soil percolates. Author

N85-33782# Los Alamos National Lab., N. Mex.
NUCLEAR DATA FOR MCNP
R. C. Little and R. E. Seamon 1985 16 p refs Presented at the Joint Los Alamos/CEA Meeting on Monte Carlo Methods, Cadarache, France, 22 Apr. 1985
(Contract W-7405-eng-36)
(DE85-010794; LA-UR-85-1186; CONF-8504110-1) Avail: NTIS HC A02/MF A01

Sources of neutron and photon transport data are described as well as the processing of the evaluated data sets into continuous-energy and multigroup cross-section sets. The procedures for checking and validating the processed data are discussed. The question of why so many data sets are available is addressed by indicating the differences between data sets as well as their relative strengths and weaknesses. Suggestions are made to help the user in selecting appropriate cross-section sets. DOE

N85-33783# Stanford Linear Accelerator Center, Calif.
IRIS TILTING AND RF STEERING IN THE SLAC LINAC
J. T. Seeman 2 May 1985 12 p refs
(Contract AC03-76SF-00515)
(DE85-011704; SU-SLAC-CN-292) Avail: NTIS HC A02/MF A01

For some time now, the sources of RF transverse beam steering in the SLAC Linac have been a mystery. The previously known sources, coupler asymmetries and survey misalignment, have predicted deflections which are frequently much smaller than the observed deflections. A new source of RF steering was discovered: the tilting of accelerator irises. Measurements of iris tilting in a forty foot accelerator girder are compared with measurements of RF beam deflections and are found to be strongly correlated. DOE

N85-33784# California Univ., Berkeley. Lawrence Berkeley Lab.
HEAVY ION MEDICAL ACCELERATOR OPTIONS
R. A. Gough and J. R. Alonso 1985 19 p Presented at FNAL/ANL Workshop on Charged Particle Accelerators for Cancer Therapy, Batavia, Ill., 24 Jan. 1985
(DE85-011204; LBL-19033; CONF-850164-2) Avail: NTIS HC A02/MF A01

The accelerator technology available for heavy ion medical accelerators in the mass range of 1 to 40 (protons through argon is explored. Machines that are designed to produce the required intensities of a particular design ion, such as silicon (mass 28), can satisfy the intensity requirements for all lighter ions, and can produce beams with higher mass, such as argon, at somewhat reduced, but still useful intensity levels. They can also provide beams of radioactive ions, such as carbon-11 and neon-19, which are useful in diagnostic imaging and for directly verifiable treatments. These accelerators are all based on proven technology, and can be built at predictable costs. It is the conclusion of several design studies that they can be operated reliably in a hospital-based environment. DOE

N85-33785# Bendix Field Engineering Corp., Grand Junction, Colo.
DEVELOPMENT OF SOLID THORIUM-232 REFERENCE MATERIALS
P. R. Engelder, S. Donivan, and R. B. Chessmore May 1985 32 p
(Contract DE-AC07-76GJ-01664)
(DE85-011453; GJ/TMC-22) Avail: NTIS HC A03/MF A01

Thorium-232 reference materials with a matrix similar to soil and uranium-mill tailings are necessary for ensuring uniform standardization among measurements performed by remedial-action contractors. Some 200 pounds each of three different concentrations of Th-232 reference material were prepared by diluting a thorium ore with soil. Target values for Th-232 content were 70, 30, and 10 pCi/q. The recommended thorium-232 concentrations for the three reference materials are 71.2 + or - 2.0 pCi/g, 30.5 + or - 0.6 pCi/g, and 10.2 + or - 0.3 pCi/g. DOE

N85-33786# Mound Lab., Miamisburg, Ohio.
NEUTRON FLUX, SPECTRUM AND DOSE EQUIVALENT MEASUREMENTS FOR A 4500-W(th) 238 PuO2 GENERAL PURPOSE HEAT SOURCE
M. E. Anderson 9 May 1985 13 p
(Contract DE-AC04-76DP-00053)
(DE85-011361; MLM-3248) Avail: NTIS HC A02/MF A01

Neutron flux, spectrum, and dose equivalent measurements were made for a prototype general purpose heat source (GPHS). The total emission rate is (4.5 + or - 0.4) 10(7) n/s, and the average neutron energy is (1.64 + or - 0.07) MeV. The factor for converting from neutron fluence to dose equivalent for this spectrum is (3.10 + or - 0.24) 10(-5) mRem/n-cm(-2). The factor for converting from neutron fluence to tissue absorbed dose is 3.18 + or - 0.26 x 10 to the -6 mRad/n/sq cm. DOE

N85-33787 Tuskegee Inst., Ala.
USE OF GAMMA RADIATION AS A FORM OF PRESERVATION OF SWEET POTATOES Quarterly Progress Report
1985 31 p
(Contract DE-FG02-84CH-10211)
(DE85-011998) Avail: NTIS MF A03/MF A01

The effects of (GAMMA) radiation on the sweet potato weevil, organoleptic properties of sweet potatoes, protein content of same, and sweet potato quality (vitamins, color, texture, and carbohydrates) are discussed. Evaluation of preliminary results indicate that changes should be made in irradiation procedures/conditions and analyses. DOE

N85-33788# Brookhaven National Lab., Upton, N. Y.
COMMISSIONING THE POLARIZED BEAM IN THE AGS
L. G. Ratner, H. Brown, I. H. Chiang, E. Courant, C. Gardner, D. Lazarus, Y. Y. Lee, Y. Makdisi, S. Sidhu, and J. Skelly 1985 16 p Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC02-76CH-00016)
(DE85-010958; BNL-36325; CONF-850504-16) Avail: NTIS HC A02/MF A01

The operation of a high energy polarized proton beam is described. A 2 micron of polarized H(-) was accelerated through the Linac to 200 MeV with a polarization of about 65%. One micron A was injected into the alternating gradient synchrotron (AGS) and acceleration attempts began. Several relatively short runs were made during the next 3 months. On June 26 the AGS polarized beam reached 13.8 GeV/c to exceed the previous ZGS peak momentum of 12.75 GeV/c. Commissioning continued to the point where 10 to the 10th power polarized protons were acclerated to 16.5 GeV/c with 40% polarization. Two experiments had a short polarized proton run. A description of the facility and of the methods used for preserving the polarization of the accelerating beam is presented. DOE

N85-33789# Oregon State Univ., Corvallis. Dept. of Physics.
K(-) HYDROGEN BOUND AND CONTINUUM STATES IN MOMENTUM SPACE
R. H. Landau 1985 12 p Presented at 8th Symp. on Nucl. Phys., Oaxtepec, Mexico, 8 Jan. 1985
(Contract DE-AT06-79ER-10405)
(DE85-010429; CONF-850159-3) Avail: NTIS HC A02/MF A01

A short discussion of the anti K N interaction and a brief discussion of the kaon-nucleus interaction (these problems are not isolated) is presented. The recent K(-)p atom experiment and related phenomenology are discussed. This leads to the heart of this matter, calculations with the momentum space schroedinger equation including both the coulomb and nuclear forces when both open and closed channels are present. A comparison of the results of these calculations with the experiment is also presented. DOE

N85-33790# Fermi National Accelerator Lab., Batavia, Ill.
HEAVY QUARKS AND CP: MORIOND 1985
James D. Bjorken Mar. 1985 21 p refs Presented at the 5th Moriond Workshop on Heavy Quarks, Flavor Mixing, and CP Violation, La Plagne, France, 13-19 Jan. 1985
(DE85-010553; FNAL/C-85/45; CONF-850171-1) Avail: NTIS

HC A02/MF A01

The presentations at the Fifth Moriond Workshop on Heavy Quarks, Flavor Mixing, and CP Violation are summarized. The following topics are reviewed. What's New (beyond the top, top quarks, bottom quarks, charm quarks, strange quarks, and others). Why is all this being done (strong interactions and hadron structure, and electroweak properties. What next (facilities and can one see CP violation in the B-anti B system). DOE

N85-33791# Los Alamos National Lab., N. Mex.
ACCELERATOR VIBRATION ISSUES
R. A. Tennant 1985 3 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-010766; LA-UR-85-1172; CONF-850504-17) Avail: NTIS HC A02/MF A01

Vibrations induced in accelerator structures can cause particle-beam jitter and alignment difficulties. Sources of these vibrations may include pump oscillations, cooling-water turbulence, and vibrations transmitted through the floor to the accelerator structure. Drift tubes (DT) in a drift tube linac (DTL) are components likely to affect beam jitter and alignment because they normally have a heavy magnet structure on the end of a long and relatively small support stem. The natural vibrational frequencies of a drift tube have been compared with theoretical predictions. In principle, by knowing natural frequencies of accelerator components and system vibrational frequencies, an accelerator can be designed that does not have these frequencies coinciding. DOE

N85-33792# Stanford Linear Accelerator Center, Calif.
NEW FORMULATION FOR LINEAR ACCELERATOR DESIGN
Z. D. Farkas Apr. 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract DE-AC03-76SF-00515)
(DE85-011171; SU-SLAC-PUB-3653; CONF-850504-19) Avail: NTIS HC A02/MF A01

Three basic, calculable and measurable parameters are defined. With these parameters, expressions for the radio frequency induced, beam induced, and loaded section voltages and average section gradients are derived. Unlike the present well known expressions, these alternate expressions are valid for continuous wave, pulsed, and single bunch beams, for both lossy and lossless sections and for both standing wave and travelling wave sections. These alternate expressions are used to maximize the efficiency and the gradient for a given peak power. DOE

N85-33793# Los Alamos National Lab., N. Mex.
DESIGN STATUS OF HEAVY ION INJECTOR PROGRAM
E. O. Ballard, E. A. Meyer, H. L. Rutkowski, R. P. Shurter, F. W. VanHaaften, and K. B. Riepe (Pulse Sciences, Inc.) 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13 May 1985
(Contract W-7405-eng-36)
(DE85-010751; LA-UR-85-1380; CONF-850504-14) Avail: NTIS HC A02/MF A01

Design and development of a sixteen beam, heavy ion injector is in progress at Los Alamos National Laboratory (LANL) to demonstrate the injector technology for the High Temperature Experiment (HTE) proposed by Lawrence Livermore Laboratory (LBL). The injector design provides for individual ion sources mounted to a support plate defining the sixteen beam array. The beamlets are electrostatically accelerated through a series of electrodes inside an evacuate 10 to the minus 7th power torr high voltage (HV) accelerating column. DOE

N85-33794# Los Alamos National Lab., N. Mex.
ELECTRON TRAJECTORIES IN A COMBINED WIGGLER AND ALTERNATING GRADIENT QUADRUPOLE FIELD
T. F. Wang and R. K. Cooper 1985 4 p refs Presented at Particle Accelerator Conf., Vancouver, British Columbia, 13-16 May 1985
(Contract W-7405-eng-36)
(DE85-010727; LA-UR-85-1490; CONF-850504-10) Avail: NTIS HC A02/MF A01

Electron trajectories in a combined wiggler and alternating gradient quadrupole field were studied.The quadrupole field is assumed to vary continuously along the symmetry axis. The linearized equations of electron motion are solved analytically for a plane-polarized wiggler by using the two-scale perturbation method. A comparison with the numerical solution is presented, and the conditions for unstable trajectories are discussed. DOE

N85-33795# Los Alamos National Lab., N. Mex.
QUARK STRUCTURE OF NUCLEI
T. Goldman 1985 9 p refs Presented at the Hadronic Probes and Nucl. Interactions Meeting, Tempe, Ariz., 11-14 Mar. 1985
(Contract W-7405-eng-36)
(DE85-010781; LA-UR-85-1375; CONF-8503120-3) Avail: NTIS HC A02/MF A01

The motivations for a direct description of nuclei in terms of quarks and gluons are discussed. A specific model implementing such a description is outlined. The importance of spin interactions for such descriptions is emphasized. Positive results, including a nonzero binding energy for a 12 quark system, are reported. Future plans and problems for refining the calculations are indicated. DOE

N85-33796# Pacific Northwest Lab., Richland, Wash.
CURRENT REGULATORY AND LICENSING STATUS FOR BYPRODUCT SOURCES, FACILITIES AND APPLICATIONS
G. L. Tingey, G. A. Jensen, and R. F. Hazelton Feb. 1985 8 p refs Presented at Waste Management '85, Tucson, Arizona, 24 Mar. 1985
(DE85-010967; PNL-SA-12622; CONF-850314-61) Avail: NTIS HC A02/MF A01

Public use of nuclear byproducts, especially radioactive isotopes, will require approval by various regulatory agencies. Use of cesium-137 as an irradiation source for sterilizing medical products will require US Nuclear Regulatory Commission (NRC) approval. Two applications have been filed with NRC, and approval is expected soon. Widespread use of irradiation for food products depends on a favorable ruling by the Food and Drug Administration (FDA). A ruling is pending that would permit irradiation of fruits and vegetables up to 100 krad. NRC also controls the use of isotopes in remote power generators, but little regulatory action has been required in recent years. Recent development of radioluminescent (RL) lighting for runway lights has led to interest by commercial manufacturers. At the present time, a license has been issued to at least one manufacturer for sale of tritium-powered runway lights. DOE

N85-33797# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRON AND ION CYCLOTRON HEATING CALCULATIONS IN THE TANDEM-MIRROR
G. R. Smith 8 May 1985 6 p refs Presented at the 6th Topical Conf. on Radio Frequency Plasma Heating, Pine Mountain, Ga., 13 May 1985
(Contract W-7405-eng-48)
(DE85-011858; UCRL-92397; CONF-8505130-4) Avail: NTIS HC A02/MF A01

To better understand and predict tandem-mirror experiments, a comprehensive Mirror Equilibrium Radial Transport and Heating (MERTH) code is being built. The method for developing the code is discussed. Plans for the installation of physics packages for electron- and ion-cyclotron heating of the plasma are given. DOE

N85-33798# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
GENERALIZED STRING AMPLITUDE AND WAVE EQUATION FOR HADRONS
H. Suura 1985 9 p refs
(Contract DE-AC02-83ER-40105)
(DE85-011492; DOE/ER-40105/T1; COO-1764-436) Avail: NTIS HC A02/MF A01

A gauge invariant Hamiltonian formulation of hadron dynamics

involving a generalized string amplitude is proposed. Applied to the quark propagator, it yields a non-linear wave equation reflecting the shielding of the long range potential. The equation allows a solution consistent with the conventional notion of a spontaneous symmetry breaking. The solution also gives the pion wave function in the symmetry limit. DOE

N85-33799# Brookhaven National Lab., Upton, N. Y.
POLYETHYLENE SOLIDIFICATION OF LOW-LEVEL WASTES
P. D. Kalb and P. Colombo Feb. 1985 97 p refs
(Contract DE-AC02-76CH-00016)
(DE85-012568; BNL-51867) Avail: NTIS HC A05/MF A01

The results of an investigation on the solidification of low-level radioactive waste in polyethylene are discussed. Waste streams included those which result from advanced volume reduction technologies (dry evaporator concentrate salts and incinerator ash) and those which remain problematic for solidification using contemporary agents (ion exchange resins). Four types of commercially available low-density polyethylenes were employed which encompass a range of processing and property characteristics. Process development studies were conducted to ascertain optimal process control parameters for successful solidification. Maximum waste loadings were determined for each waste and polyethylene type. Property evaluation testing was performed on laboratory-scale specimens to assess the potential behavior of actual waste forms in a disposal environment. DOE

N85-33800# Syracuse Univ., N. Y.
PREPARATION AND USE OF VERY PURE o-D2
A. Honig, M. Lewis, Z. Z. Yu, and S. Yucel 26 Mar. 1985 34 p refs
(Contract DE-FG02-84ER-53179)
(DE85-009415; DOE/ER-53179/T3; TR-1) Avail: NTIS HC A03/MF A01

Optimum production and utilization of spin-polarized deuterium as a fusion fuel requires long nuclear spin-lattice relaxation times at temperatures near 4K. This can be achieved with very high purity ortho-D2. Experimental methods and results of total-adsorption catalysis of D2 para-ortho conversion in the 4 to 15K temperature region are reported using as catalysts activated alumina and partially-activated charcoal. Because of the strongly anisotropic adsorbate binding on alumina, the ortho-D2 equilibrium concentration near 10 to 12K (where the conversion time is acceptable) is not high enough, and near 4K (where the equilibrium ortho-D2 concentration is satisfactory) the conversion time is almost prohibitively too long to permit achievement of the desired ortho-D2 purity. Although doping alumina with paramagnetic ions could improve this situation, it would be at the expense of excessive back-conversion upon desorption. DOE

N85-33801# Argonne National Lab., Ill.
MICRODOSIMETRIC SPECTRA MEASUREMENTS OF JANUS NEUTRONS
I. R. Marshall and F. S. Williamson 1985 28 p refs Presented at 9th Symp. on Microdosimetry, Toulouse, 20 May 1985
(Contract W-31-109-38)
(DE85-012108; CONF-850506-4) Avail: NTIS HC A03/MF A01

Neutron radiation from the JANUS reactor at Argonne National Laboratory is being used with increasing frequency for major biological experiments. The fast neutron spectrum has a Kerma-weighted mean energy of 0.8 MeV and low gamma-ray contamination. In 1984 the JANUS fission converter plate of highly enriched uranium was replaced by one made of low-enriched uranium. We recorded microdosimetric spectra at several different positions in the high-flux irradiation room of JANUS before the change of the converter plate. Each set of measurements consisted of spectra taken at three different site diameters (0.5, 1.0, and 5.0 (MU)m) and in both attenuator up and attenuator down configurations. At two conventional dosimetry reference positions, two sets of measurements were recorded. At three biological reference positions, measurements simulating several biological irradiation conditions, were taken. The dose rate of each position was estimated and compared with dose rates obtained previously by conventional dosimetry. Comparison of the different measurements showed no major change in spectra as a function of position or irradiation condition. First results from similar sets of measurements recorded after the installment of the new converter plate indicate no major change in the spectra. DOE

N85-33802# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
REACTION OF URANIUM AND THE FLUOROCARBON FC-75
R. H. Young 4 Apr. 1985 21 p refs
(Contract DE-AC09-76SR-00001)
(DE85-012322; DPST-85-232) Avail: NTIS HC A02/MF A01

Because of criticality concerns with water cooling in enriched uranium upgrading, a fluorocarbon has been evaluated as a replacement coolant for internal module components in the Plasma Separation Process (PSP). The interaction of bulk uranium and of powdered uranium with FC-75 has been investigated at temperatures between 200 and 700 C. The gas pressure and the metal temperature were monitored as a function of time. Modest temperature changes of 50 to 100 C were observed for the bulk uranium/fluorocarbon reaction. Much larger changes (up to 1000 C) were noted for the reaction involving high surface area uranium powder. These temperature transients, particularly for the powdered uranium reaction, were short-lived (< 10 seconds) and indicative of the formation of a protective layer of reaction products. Analysis of residual gas products by infrared spectroscopy indicated that one potentially serious hazard, UF6, was not present; however, several small toxic fluorocarbons were produced by thermolysis and/or reaction. X-ray diffraction analysis of the residual solids indicated UF4 and UO2 were the major solid products. DOE

N85-33803# Pacific Northwest Lab., Richland, Wash.
IRRADIATION OF NORTHWEST AGRICULTURAL PRODUCTS
D. E. Eakin and G. I. Tingey Feb. 1985 6 p Presented at Waste Management 1985, Tucson, Ariz., 24 Mar. 1985
(Contract DE-AC06-76RL-01830)
(DE85-012455; PNL-SA-12625; CONF-850314-67) Avail: NTIS HC A02/MF A01

Irradiation of food for disinfestation and preservation is increasing in importance because of increasing restrictions on various chemical treatments. Irradiation treatment is of particular interest in the Northwest because of a growing supply of agricultural products and the need to develop new export markets. Several products have, or could potentially have, significant export markets if stringent insect control procedures are developed and followed. Due to the recognized potential benefits of irradiation, this program was conducted to evaluate the benefits of using irradiation on Northwest agricultural products. Commodities currently included in the program are cherries, apples, asparagus, spices, hay, and hides. DOE

N85-33804# Los Alamos Scientific Lab., N. Mex.
GAMMA-RAY LINE INTENSITIES FOR DEPLETED URANIUM
C. E. Moss 1985 5 p refs Presented at Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract W-7405-eng-36)
(DE85-012674; LA-UR-85-1602) Avail: NTIS HC A02/MF A01

Measurements of the gamma ray line intensities from depleted uranium allowed the determination of which of two conflicting previous experiments was correct. For the 1001 keV line, a branching ratio was obtained of 0.834 + or - 0.007, in good agreement with one of the previous experiments. A table compares the intensities for several lines with those obtained in previous experiments. DOE

N85-33805# Oak Ridge National Lab., Tenn.
FUSION FACILITY SITING CONSIDERATIONS
G. T. Bussell 1985 6 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-012894; CONF-850310-105) Avail: NTIS HC A02/MF A01

Inherent in the fusion program's transition from hydrogen

devices to commercial power machines is a general increase in the size and scope of succeeding projects. This growth will lead to increased emphasis on safety, environmental impact, and the external effects of fusion in general, and of each new device in particular. An important consideration in this regard is site selection. Major siting issues that may affect the economics, safety, and environmental impact of fusion are examined. DOE

N85-33806# California Univ., Livermore. Lawrence Livermore Lab.
ULTRAVIOLET RADIATION-DAMAGE ABSORPTION PEAK IN SOLID DEUTERIUM-TRITIUM, REVISION 1
E. M. Fearon, R. T. Tsugawa, P. C. Souers, J. D. Poll (Guelph Univ.), and J. L. Hunt (Guelph Univ.) 1985 8 p Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract W-7405-eng-48)
(DE85-012969; UCRL-91499-Rev-1; CONF-850405-10-Rev-1) Avail: NTIS HC A02/MF A01

An ultraviolet absorption peak was seen in solid deuterium-tritium and hydrogen-tritium at a sensor temperature of 5 K. The peak occurs at 3.6 eV and is about 1.5 eV wide. It bleaches out when the temperature is raised to about 10 K but reappears upon cooling and is, therefore, radiation induced. At 5 K, the peak forms on a time scale of minutes and appears to represent part-per-million levels of electron-mass defects. The suggested model is that of a trapped electron, where the peak is the ground state-to-the-conduction band transition. A marked isotope effect is seen between D-T and H-T. DOE

N85-33807# General Electric Co., Philadelphia, Pa. Space Systems Div.
DEVELOPMENT OF IMPROVED THERMOELECTRIC MATERIALS FOR SPACE NUCLEAR POWER SYSTEMS Technical Progress Report, Mar. 1985
1985 35 p
(Contract DE-AC01-84NE-32123)
(DE85-013079; DOE/NE-32123/T1; TPR-6) Avail: NTIS HC A03/MF A01

The development of an improved SiGe alloy and the development of an as yet unspecified advanced material intended to have superior performance characteristics when compared to SiGe alloys are discussed. Significant progress was made toward producing a SiGe based material with an improved figure-or-merit. In these studies, a quantitative evaluation of the characteristics which produce the low thermal conductivities observed in SiGe alloys is being developed. Specific areas of emphasis include the effects of grain size, charge carrier and GaP concentrations. An alternate method for alloying with GaP was evaluated in which the GaP was added to SiGe during the melting operation. DOE

N85-33808# Oak Ridge National Lab., Tenn.
CALCULATED NEUTRON-INDUCED CROSS SECTIONS FOR /SUP 63,65/Cu/SUP 58,60/Ni AND (52) Cr FROM 1 TO 20 MeV AND COMPARISONS WITH EXPERIMENTS
D. M. Hetrick, C. Y. Fu, and D. C. Larson 1985 5 p refs Presented at the Intern. Conf. on Nucl. Data for Basic and Appl. Sci., Santa Fe, N. Mex., 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-011928; CONF-850507-13) Avail: NTIS HC A02/MF A01

Nuclear model codes were used to compute cross sections for neutron-induced reactions on sup 63, 65 Cu, sup 58, 60 Ni, and sub 52 Cr for incident energies from 1 to 20 MeV. The input parameters for the model codes determined through analysis of experimental data in this energy region. The models used, the input data, the resulting calculations, and comparisons with measured data are discussed. DOE

74 OPTICS

Includes light phenomena.

N85-33809 Defence Research Information Centre, Orpington (England).
METHODS FOR THE OPTICAL PROCESSING OF SIGNALS
J. Havel, S. Saic, and V. Tomes Feb. 1985 15 p refs Transl. into ENGLISH from Automatizace (Czechoslovakia), v. 24, no. 2, 1981 p 41-45
(DRIC-T-7439; BR94717) Copyright. Avail: NTIS HC A02/MF A01

Fundamental methods are given for the processing of signals with transformation by means of coherent optics, including the results of experiments. The experimental equipment, the optical processor, and the use of an ADT manipulator and CAMAC modular system are described. Author (ESA)

N85-33810# Department of the Air Force, Washington, D.C.
REMOVABLE CLEANABLE ANTIREFLECTION SHIELD Patent Application
H. L. Task, inventor (to Air Force) Filed 10 Jan. 1985 9 p
(AD-D011735; US-Patent-Appl-SN-690212) Avail: NTIS HC A02/MF A01 CSCL 06/17

A replaceable anti-reflection shield for the glare surface beneath the windscreen an aircraft is described which comprises a flexible panel of light absorbing material, such as black cloth, velvet, canvas or plastic, of size and configuration corresponding to that of the glare surface for placement on and conformance to the contour of the glare surface beneath the windscreen, and peripheral attaching means such as adhesive strips, snaps. Velcro strips, suction cups, or similar devices, on the flexible panel for detachably securing the peripheral edges of the panel to the glare surface. Whereby the panel is easily removed for cleaning or replacement. GRA

N85-33811# Department of the Army, Washington, D. C.
DUAL OPTICAL MECHANICAL POSITION TRACKER Patent Application
S. L. Everett, Jr., inventor (to Army) Filed 6 Jun. 1985 19 p
(AD-D011739; US-Patent-Appl-SN-742152) Avail: NTIS HC A02/MF A01 CSCL 14/5

This patent application describes an apparatus for retaining control of moving carriage impact dot matrix print heads when subjected to strong external forces such as shock and/or vibration. Position and direction of carriage movement is provided by a photo emitter-sensor assembly and a slotted timing wheel or disc having a plurality of equally spaced slots whose slot width is equal to the slot separation. The slot width is sufficient to frame a pair of side-by-side emitters which operate in conjunction with a pair of side-by-side sensors on the other side of the timing wheel. The order or sequence in which the sensors receive photo energy from their respective emitters indicates the direction of rotation of the timing wheel while simultaneous reception of photo energy by the side-by-side sensors provides an indication of valid rest position of the carriage drive motor. GRA

N85-33330# Joint Publications Research Service, Arlington, Va.
REFRACTION OF NARROW PROBING LIGHT BEAM IN MULTILAYER OPTICAL FIBER Abstract Only
S. D. Mirovitskaya and D. L. Kudryavtsev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 11 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 73-76 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33331# Joint Publications Research Service, Arlington, Va.
TEMPERATURE SENSITIVITY OF FIBER-OPTIC TRANSMISSION LINE Abstract Only
F. A. Shatalov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 11 Transl. into ENGLISH from Radiotekhn. (Moscow), no. 5, May 1984 p 76-80 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

N85-33429# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF OPTICAL INFORMATION-

MEASUREMENT CHANNELS WITH UTILIZATION OF SCATTERING EFFECTS Abstract Only
S. I. Bychkov, V. N. Pavlov, and M. M. Shevyakov *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 64 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radioelektron. (Kiev), v. 26, no. 9, Sep. 1983 p 10-14 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

N85-33432# Joint Publications Research Service, Arlington, Va.
MEAN INTENSITY OF WAVE REFLECTED BY WAVEFRONT REVERSING MIRROR IN TURBULENT MEDIUM Abstract Only
A. N. Malakhov, A. V. Polovinkin, and A. I. Saichev *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-003) 21 Mar. 1984 p 71 Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedeniy: Radiofiz. (Gorkiy), v. 26, no. 5, May 1983 p 579-586 (For primary document see N85-33381 22-33)
Avail: NTIS HC A05/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-33812# Naval Research Lab., Washington, D. C.
CURRENT ENHANCEMENT IN A CONDUCTING CHANNEL Memorandum Report, 1984 - 1985
Y. Y. Lau, M. Lampe, R. F. Fernsler, and B. Hui 30 May 1985 12 p
(ARPA Order 4395)
(AD-A155418; NRL-MR-5587) Avail: NTIS HC A02/MF A01 CSCL 20/9

By the use of a simple model, we show that the transverse motion of a current-carrying filament in an electrically conducting medium (plasma) may inductively produce a total current three times as large. An explanation of this phenomenon is given. These conclusions are valid as long as the channel conductivity is sufficiently high. They are a direct consequence of the Ampere-Faraday's Laws and appear to be relatively insensitive to the geometry of the channel. The recent experimental observations cited above may be just one of the many manifestations of this electromagnetic phenomenon. Indeed, because of the simplicity but surprising nature of these phenomena, one may well wonder whether this and related phenomena, in particular the limiting value of F = 3, have been noted elsewhere (e.g., geomagnetic dynamo, magnetohydrodynamic layers, etc.). GRA

N85-33813# Naval Research Lab., Washington, D. C.
RECOMBINATION AND IONIZATION IN A NITROGEN PLASMA Memorandum Report, 1984 - 1985
R. D. Taylor and A. W. Ali 7 Jun. 1985 56 p
(AD-A155426; NRL-MR-5594) Avail: NTIS HC A04/MF A01 CSCL 20/9

A collisional-radiative model for nitrogen plasma (N,N+, and N++) has been developed. The results for an optically thin, and optically thick in UV lines, are presented. The approach taken in the model is to solve a time dependent set of rate equations for a large number of excited states of N and N+ for a wide range of tellurium and neon. The excited states of interest emit radiation in the ultraviolet, visible and infrared which could be used for air plasma channel diagnostics. The model delineates the regimes in Te and Ne where the excited states are in local thermodynamic equilibrium and when they deviate from LTE, and is developed as a building block for an extensive radiative transfer model for air. GRA

N85-33814# Department of Energy, Washington, D. C.
SYSTEM AND METHOD OF OPERATING TOROIDAL MAGNETIC CONFINEMENT DEVICES Patent Application
M. S. Chance, S. C. Jardin, T. H. Stix, R. C. Grimm, J. Manickam, and M. Okabayashi, inventors (to DOE) Filed 30 Aug. 1984 39 p
(Contract DE-AC02-76CH-03073)
(DE85-011670; US-Patent-Appl-SN-645725) Avail: NTIS HC A03/MF A01 CSCL 20I

This invention pertains to methods and arrangements for attaining high beta values in plasma confinement devices. More specifically, this invention pertains to methods for accessing the second stability region of operation in toroidal magnetic confinement devices. DOE

N85-33815# Princeton Univ., N. J.
METHOD AND APPARATUS FOR MAINTAINING EQUILIBRIUM IN A HELICAL AXIS STELLARATOR Patent Application
A. Reiman (Princeton Univ.) and A. Boozer, inventor (to DOE) (Princeton Univ.) Filed 31 Oct. 1984 15 p
(Contract DE-AC02-76CH-03073)
(DE85-011626; Patent-Application-SN-666585) Avail: NTIS HC A02/MF A01 CSCL 20I

Apparatus for maintaining three-dimensional magnetohydrodynamic (MHD) equilibrium in a plasma contained in a helical axis stellarator includes a resonant coil system, having a configuration such that current there through generates a magnetic field cancelling the resonant magnetic field produced by currents driven by the plasma pressure on any given flux surface resonating with the rotational transform of another flux surface in the plasma. Current through the resonant coil system is adjusted as a function of plasma beta. DOE

N85-33816# Department of Energy, Washington, D. C.
ELMO BUMPY SQUARE PLASMA CONFINEMENT DEVICE Patent Application
L. W. Owen, inventor (to DOE) (Martin Marietta Energy Systems, Inc.) Filed [1985] 20 p
(Contract DE-AC05-84OR-21400)
(DE85-011628; US-Patent-Appl-SN-591646) Avail: NTIS HC A02/MF A01 CSCL 20I

The invention is an Elmo bumpy type plasma confinement device having a polygonal configuration of closed magnet field lines for improved plasma confinement. In the preferred embodiment, the device is of a square configuration which is referred to as an Elmo bumpy square (EBS). The EBS is formed by four linear magnetic mirror sections each comprising a plurality of axisymmetric assemblies connected in series and linked by 90(0) sections of a high magnetic field toroidal solenoid type field generating coils. These coils provide corner confinement with a minimum of radial dispersion of the confined plasma to minimize the detrimental effects of the toroidal curvature of the magnetic field. Each corner is formed by a plurality of circular or elliptical coils aligned about the corner radius to provide maximum continuity in the closing of the magnetic field lines about the square configuration confining the plasma within a vacuum vessel located within the various coils forming the square configuration confinement geometry. DOE

N85-33817# California Univ., Los Angeles.
KEY ISSUES OF FUSION NUCLEAR TECHNOLOGY DEVELOPMENT (FINESSE)
G. D. Morgan 17 May 1985 90 p
(Contract DE-AS03-84ER-52105)
(DE85-012599; DOE/ER-52105/T2) Avail: NTIS HC A05/MF A01

The following topics were discussed: (1) liquid metal blankets, (2) solid breeder blankets, (3) tritium processing and vacuum systems, (4) plasma-interactive components, (5) radiation shield, (6) fusion test facilities, and (7) test plan scenarios and costs. DOE

N85-33818# Texas Univ., Austin. Inst. for Fusion Studies.
COLLISIONAL TRANSPORT FOR A SUPERTHERMAL ION SPECIES IN A PLASMA
F. Cozzani and W. Horton Apr. 1985 39 p refs
(Contract DE-FG05-80ET-3088)
(DE85-011943; DOE/ET-53088/169; IFSR-169) Avail: NTIS

HC A03/MF A01

The transport theory of a high energy ion species, injected isotropically in a magnetized plasma is considered for arbitrary values of (sup OMEGA) sub HE sup tau/sub s1/, (sup OMEGA) sub HE being the high energy ion cyclotron frequency and sup tau sub s1 the slowing down time, respectively. The assumption of low density of the high energy species and the scaling on the velocities: v/sub i< < v sub HE< < v sub e are used to decouple the kinetic equation for the high energy species from the kinetic equation for background ions and electrons, and to simplify the cross collisional integrals. The kinetic equation is solved by a Chapman-Enskog expansion in the strength of the gradients; an equation for the first correction to the lowest order distribution function is obtained without scaling a priori - the collision frequency with respect to the gyrofrequency. Various transport coefficients are explicitly calculated for the two cases of an unmagnetized and a strongly magnetized plasma. DOE

N85-33819# Oak Ridge National Lab., Tenn.
ASSESSMENT OF MAGNETIC FIELD ASYMMETRIES IN ELMO BUMPY SQUARE
T. Uckan and N. A. Uckan May 1985 21 p
(Contract DE-AC05-84OR-21400)
(DE85-011905; ORNL/TM-9517) Avail: NTIS HC A02/MF A01

There exist two separate and independent magnetic field asymmetries in the ELMO Bumpy Square (EBS). One in associated with the small perturbations in the magnetic field, known as the field errors, caused by coil misalignments during installation, imperfection in coil winding, etc. The second source of asymmetry is the magnetic field ripple in the high field toroidal solenoids (corners) produced by the finiteness of the number of coils. In general, these two sources of asymmetry introduce enhanced transport losses (in addition to other effects) to the system, although they effect different classes of particles. Toroidally passing (circulating) particles (v/sub parallel//v approx. 1) are influenced by the field errors whereas trapped particles (v/sub parallel//v approx. 0) in the corners are influenced by the field ripple. These two effects are discussed separately and the allowable magnitudes of the field error and field ripple in EBS are calculated, both for an experimental size device and for a reactor. DOE

N85-33820# Oak Ridge National Lab., Tenn.
FUSION POWER DEMONSTRATION (FPD) MAINTENANCE AND DISASSEMBLY CONSIDERATIONS
P. T. Spampinato 1985 6 p Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-011413; CONF-850310-94) Avail: NTIS HC A02/MF A01

The Fusion Power Demonstration study is the development of a tandem mirror reactor design that follows the operation of the Mirror Fusion Test Facility. It is a power-producing device utilizing the deuterium-tritium fuel cycle; hence, much of its maintenance must be accomplished remotely because of neutron-induced gamma activation. The maintenance philosophy adopted and its impact on the device configuration are examined, as well as some of the specific requirements of scheduled and unscheduled component replacements. This work is being used for the next phase of mirror reactor concepts: the Mini-Mars reactor study. DOE

N85-33821# Washington Univ., Seattle. Fusion Plasma Program.
CONFINEMENT AND HEATING OF HIGH BETA PLASMA WITH EMPHASIS ON COMPACT TOROIDS. COMPACT TOROID RESEARCH
G. C. Vlases and Z. A. Pietrzyk Nov. 1984 195 p refs
(Contract DE-AT06-72ET-53047)
(DE85-011463; DOE/ET-53047/22) Avail: NTIS HC A09/MF A01

Two older projects associated with very high energy density plasmas, specifically the High Density field Reversed Configuration and the Liner Plasma Compression Experiment, have been completed. Attention has been turned to compact toroid experiments of more conventional density, and three experiments have been initiated. These include the Coaxial Slow Source Experiment, the Variable Length FRC Experiment, and Variable Angle C theta P Experiment. In each case, the project was begun in order to provide basic plasma physics information on specific unresolved issues of programmatic importance to the national CT Program. DOE

N85-33822# Oak Ridge National Lab., Tenn.
DIGITAL CHARACTERIZATION OF PARTICLE TRACKS FOR MICRODOSIMETRY
J. E. Turner, R. N. Hamm, G. S. Hurst, H. A. Wright, and M. M. Chiles 1985 18 p refs Presented at the 9th Symp. on Microdosimetry, Toulouse, 20 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-012898; CONF-850506-6) Avail: NTIS HC A02/MF A01

Work is in progress to develop a digital approach to microdosimetry and to construct a phototype instrument to obtain digital information about charged particle tracks. The objective of such a device is to measure the numbers of electrons produced in various subvolumes of a chamber gas along a particle's path. Results of Monte Carlo calculations of charged particle tracks in a cubical time projection ionization chamber containing methane are described. Results are presented to show the effects of electron diffusion during charge collection. The calculations indicate that the optimum ratio of field strength and pressure is about 0.6 volts cm(-1) torr(-1). Examples of proton, carbon ion, and electron tracks are shown. DOE

N85-33823# Department of Energy, Washington, D. C. Office of Energy Research.
MAGNETIC FUSION PROGRAM PLAN
Feb. 1985 17 p
(DE85-009861; DOE/ER-0214) Avail: NTIS HC A02/MF A01

The present conditions of the energy situation are consistent with national priorities for the support of basic and applied research. It is realistic in taking advantage of the technical position that the United States has already established in fusion research to make cost effective progress toward the development of fusion power as a future energy option. DOE

N85-33824# California Univ., Livermore. Lawrence Livermore Lab.
BLANKET OPTIMIZATION STUDIES FOR CASCADE
W. R. Meier and E. C. Morse (California Univ., Berkeley) 28 Feb. 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-7405-eng-48)
(DE85-010002; UCRL-91646; CONF-850310-61) Avail: NTIS HC A02/MF A01

A nonlinear, multivariable, blanket optimization technique is applied to the Cascade inertial confinement fusion reactor concept. The thickness of a two zone blanket, which consists of a BeO multiplier region followed by a LiAlO2 breeding region, is minimized subject to constraints on the tritium breeding ratio, neutron leakage, and heat generation rate in Al/SiC tendons that support the chamber wall. DOE

N85-33825# Oak Ridge National Lab., Tenn.
HIGH-FIELD LAUNCH ELECTRON CYCLOTRON HEATING EXPERIMENTS IN THE ELMO BUMPY TORUS
D. A. Rasmussen, D. B. Batchelor, D. W. Swain, T. L. White, H. D. Kimrey, T. S. Bigelow, J. A. Cobble, D. L. Hillis, R. K. Richards, and T. Uckan May 1985 46 p refs
(Contract DE-AC05-84OR-21400)
(DE85-012068; ORNL/TM-9399) Avail: NTIS HC A03/MF A01

The midplane microwave heating system in the ELMO Bumpy Torus (EBT) was supplemented with power launched from the high-field side of the fundamental resonance by an antenna in the magnetic coil throat. Up to 43 kW of polarized (extraordinary mode), 28-GHz power was successfully launched with one antenna. Measurements were made of changes in the core and hot electron ring plasma parameters when throat-launch power

was added. The bulk core plasma parameters were degraded while the ring parameters, in the launch cavity, were improved. These results are explained in light of a modified picture of electron cyclotron heating (ECH) in EBT. A picture of localized microwave absorption and particle losses is supported by additional measurements. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-33826* National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
LIQUID CRYSTAL LIGHT VALVE STRUCTURES Patent
N. John Koda, inventor (to NASA) (Hughes Aircraft Co., Los Angeles, Calif.) Issued 11 Jun. 1985 4 p Filed 9 Jan. 1984 Supersedes N84-22457 (22 - 12, p 1912)
(NASA-Case-MSC-20036-1; US-Patent-4,522,469; US-Patent-Appl-SN-569372; US-Patent-Class-350-342; US-Patent-Class-204-192C; US-Patent-Class-204-192P; US-Patent-Class-428-432; US-Patent-Class-428-698; US-Patent-Class-428-913) Avail: US Patent and Trademark Office CSCL 30L

An improved photosensor film and liquid crystal light valves embodying said film is provided. The photosensor film and liquid crystal light valve is characterized by a significant lower image retention time while maintaining acceptable photosensitivity. The photosensor film is produced by sputter depositing CdS onto an ITO substrate in an atmosphere of argon/H2S gas while maintaining the substrate at a temperature in the range of about 130 C to about 200 C and while introducing nitrogen gas into the system to the extent of not more than about 1% of plasma mixture. Following sputter deposition of the CdS, the film is annealed in an inert gas at temperatures ranging from about 300 C to about 425 C. NASA

N85-33827# Hughes Research Labs., Malibu, Calif.
STRIATION FREE DOPED SILICON Final Report, 1 Sep. 1981 - 1 Sep. 1984
G. D. Robertson Dec. 1984 154 p
(Contract F33615-81-C-5065)
(AD-A155730; AFWAL-TR-84-4156) Avail: NTIS HC A08/MF A01 CSCL 20/2

The growth of float zone doped silicon crystals in the presence of strong magnetic fields has been investigated. Fields of 5000 G, oriented both transverse to and along the growth axis, have produced dopant distributions in Ga-doped Si that have not been observed previously. Reductions of dopant concentration fluctuations by factors of three have been seen for strong axial fields. In the transverse fields, the dopant distributions are quite different from those obtained in normal growth, but the fluctuations are not appreciably reduced. However, the growth of crystals without rotation is stabilized by the transverse field and this stabilization makes possible the study of fine striae in the absence of rotational striae. Such studies promise insight into the physics of the float zone process. On the other hand, the axial field appears to destabilize growth, especially at low rotation rates. Further work with the axial field is needed to develop growth techniques which will allow us to capitalize on the uniform dopant distributions that it provides. GRA

N85-33828# Department of the Air Force, Washington, D.C.
PROCESS FOR IMPROVING THE QUALITY OF EPITAXIAL SILICON FILMS GROWN ON INSULATING SUBSTRATES Patent Application
H. M. Manasevit, inventor (to Air Force) 27 Feb. 1985 28 p
(AD-D011730; US-Patent-Appl-SN-706205) Avail: NTIS HC A03/MF A01 CSCL 20/12

The present invention accomplishes the thermal oxidation of the silicon side of the interface present in epitaxial silicon films grown on yttria-stabilized cubic zirconia, (Si)/(YSZ), to form a dual-layer structure of (Si)/amorphous SiO2/ YSZ. The SiO2 films are formed in either dry oxygen (at 1100 C) or in pyrogenic steam (at 925 C) by the rapid diffusion of oxidizing species through a 425 micrometers thick cubic zirconia substrate. For instance, a 0.17 micrometers thick SiO2 layer is obtained after 100 min in pyrogenic steam at 925 C. This relatively easy transport of oxidants is unique to YSZ and other insulators which are also superionic oxygen conductors, and cannot be achieved in other existing Si/insulator systems, such as silicon-on-sapphire. GRA

N85-33829# Department of Energy, Washington, D. C.
APPARATUS AND METHOD FOR THE HORIZONTAL, CRUCIBLE-FREE GROWTH OF SILICON SHEET CRYSTALS Patent Application
T. F. Ciszek, inventor (to DOE) Filed 12 Sep. 1984 21 p
(Contract DE85-AC02-83CH-10093)
(DE85-011588; US-Patent-Appl-SN-649627) Avail: NTIS HC A02/MF A01 CSCL 20B

Apparatus is provided for continuously forming a silicon crystal sheet from a silicon rod in a noncrucible environment. The rod is rotated and fed toward an RF coil in an inert atmosphere so that the upper end of the rod becomes molten and the silicon sheet crystal is pulled therefrom substantially horizontally in a continuous strip. A shorting ring may be provided around the rod to limit the heating to the upper end only. Argon gas can be used to create the inert atmosphere within a suitable closed chamber. By use of this apparatus and method, a substantially defect-free silicon crystal sheet is formed which can be used for microcircuitry chips or solar cells. DOE

N85-33830# Bechtel National, Inc., San Francisco, Calif.
DESIGN IMPROVEMENTS AND COST REDUCTIONS FOR A 5000 MWh SUPERCONDUCTING MAGNETIC ENERGY STORAGE PLANT Project Final Report, Oct. 1984
R. J. Loyd, T. Nakamura, and J. R. Purcell Feb. 1985 164 p
(Contract W-7405-eng-36)
(DE85-010572; LA-10320-MS) Avail: NTIS HC A08/MF A01

The results of work performed to improve technical feasibility and reduce costs for a utility scale superconducting magnetic energy storage (SMES) plant are presented. The project used the baseline design reported in Electric Power Research Institute (EPRI) report EM-3457 as the point of departure for all modifications. Elements common to the baseline design, which is referenced often, are not included in this study. One of the technical drawbacks of the design reported in EM-3457 was use of a large, high current conductor requiring field assembly. During the course of this study, reducing the conductor current required a number of related design changes, many of which resulted in a more easily constructed plant of lower capital cost. The design uses shop fabricated conductor, is wound in four radial layers, uses resistive energy transfer from the conductor during a coil scram event, and is constructed without radial ripples in the conductor and conductor support structure. DOE

N85-33831# Hughes Research Labs., Malibu, Calif.
REFRACTIVE INDICES AND THERMO-OPTIC COEFFICIENTS OF NONLINEAR CRYSTALS ISOMORPHIC TO KH2PO4
K. W. Kirby, C. S. Hoefer, and L. G. DeShazer Feb. 1985 6 p Presented at the Topical Conf. on Basic Properties of Opt. Mater., Gaithersburg, Md., 7 May 1985
(Contract W-7405-eng-48)
(DE85-012968; UCRL-15659; CONF-850573-3) Avail: NTIS HC A02/MF A01

Refractive indices and their thermal variations were measured for eleven KDP isomorphs. Samples of KDP from different suppliers showed different indices which correlated with observed differences in lattice parameters. DOE

N85-33832# Department of Energy, Washington, D. C.
SUPERCONDUCTING MAGNETIC ENERGY STORAGE FOR ASYNCHRONOUS ELECTRICAL SYSTEMS Patent Application

H. J. Boenig, inventor (to DOE) Filed 16 May 1984 11 p refs (Contract W-7405-eng-36)
(DE85-005986; US-Patent-Appl-SN-610904) Avail: NTIS HC A02/MF A01

Provision of superconducting magnetic energy storage for a plurality of asynchronous electrical systems is proposed. A further object of the present invention is to provide load leveling and stability improvement in a plurality of independent ac systems using a single superconducting magnetic energy storage coil. DOE

N85-33833# United Kingdom Atomic Energy Authority, Harwell (England). Instrumentation and Applied Physics Div.
EFFECTS OF SPACE RADIATION ON ADVANCED SEMICONDUCTOR DEVICES. PART 3: FURTHER COSMIC RAY SIMULATION STUDIES OF SINGLE EVENT UPSETS AND LATCH-UP IN CMOS MEMORIES Final Report
J. Farren, D. Mapper, J. H. Stephen, and T. K. Sanderson Paris ESA Nov. 1984 50 p refs
(Contract ESTEC-4963/81/NL-MS)
(AERE-G-3368-Pt-3; ESA-CR(P)-2014-Pt-3) Avail: NTIS HC A03/MF A01

The use of the fission particles from a 252Cf source in the study of single event effects and latch-up in CMOS memories was studied. Heavy ions from the ALICE cyclotron for cosmic ray simulation were compared with those from the Californium-252 Assessment of Single Event Effects (CASE). The calculated and measured LET distributions obtained for the fission particles from 252Cf emphasise the advantages of the CASE system in cosmic ray simulation testing of CMOS memories. A better understanding of the heavy ions emitted, and their absorption behavior in silicon dies is obtained. Although initial experiments are encouraging in modifying the LET of the fission particles, the most suitable set-up for achieving this objective has to be established. Other aspects of the 252Cf system, such as operation in air, seem less promising. Author (ESA)

N85-33370# Joint Publications Research Service, Arlington, Va.
MAGNETIC SHIELDING WITH SUPERCONDUCTORS BASED ON NIOBIUM-TIN COMPOUNDS Abstract Only
R. V. Kalashnikov, N. B. Trusov, and A. N. Zvenigorodskaya *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 54 Transl. into ENGLISH from Elektrotekhn. (Moscow), no. 5, May 1984 p 49-51 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-33834# California Univ., Livermore. Lawrence Livermore Lab.
ROLE OF ECRH IN POTENTIAL FORMATION FOR TANDEM MIRRORS
T. D. Rognlien, Y. Matsuda, and J. J. Stewart 8 May 1985 6 p Presented at the 6th Topical Conf. on Radio Frequency Plasma Heating, Pine Mountain, Ga., 13 May 1985
(Contract W-7405-eng-48)
(DE85-011859; UCRI-92375; CONF-8505130-5) Avail: NTIS HC A02/MF A01

The axial ion plugging potential in a tandem mirror is produced by electron cyclotron resonance heating (ECRH) applied at two locations in the end mirror cell. A second harmonic (omega = omega sub c) resonance is used near the midplane to generate hot electrons which yield an electron potential barrier between center cell electrons and electrons outboard of the end cell midplane. The latter group of electrons is then heated at the fundamental resonance on the outboard side of the magnetic well which drives an ion confining potential. Fokker-Planck and Monte Carlo calculations show that such a configuration is achievable, and the scaling obeys a rather simple set of equations. Another aspect of this configuration is the experimental observation that the fundamental heating drives the overall potential of the device relative to the wall to approx. 1 kV. An analytic model predicts this behavior for very strong ECRH. Results are given a numerical study of electron confinement in a rpirror cell owing to fundamental heating as the level of the RF electric field, E sub RF, is increased. For the second part of the paper, we show that moderate levels of uniformly distributed RF fields, called cavity fields, can result in very hot (> 250 keV) tails in the electron distribution as seen in the TMX-U experiment. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-33835# National Center for Atmospheric Research, Boulder, Colo.
NATIONAL CENTER FOR ATMOSPHERIC RESEARCH Annual Report, 1984
Mar. 1985 99 p Sponsored by NSF
(PB85-191237; NCAR-AR-84) Avail: NTIS HC A05/MF A01 CSCL 04B

Ongoing research activities and the most significant recent achievements of the National Center for Atmospheric Research, which is operated by the 54-member organization, the University Corporation for Atmospheric Research, under the sponsorship of the National Science Foundation is described. A section of directories lists the scientific and technical staff, organizational structure, financial statements, visitors and publications. Abundant illustrations and photographs, and a semitechnical narrative, makes the report accessible to a wide readership of science administrators, decision makers, students, and interested laypeople. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-33836# Naval Postgraduate School, Monterey, Calif.
A HIERARCHY OF KNOWLEDGE LEVELS IMPLEMENTED IN A RULE-BASED PRODUCTION SYSTEM TO CALCULATE BOUNDS ON THE SIZE OF INTERSECTIONS AND UNIONS OF SIMPLE SETS M.S. Thesis
B. M. Tilden Dec. 1984 144 p
(AD-A155291; AD-F300613) Avail: NTIS HC A07/MF A01 CSCL 12/1

In this paper, the work is combined in the implementation of a rule based system to produce upper and lower bounds and estimates as to the size of intersections and unions of simple sets. The system constructed for this paper uses the hierarchy of knowledge levels as the tabulated statistics in the database

abstract. The system is tested and analyzed to determine the advantages and disadvantages of increasing the knowledge level of the database abstract used for the calculation and of varying the number of partitions used in constructing the database abstracts. The paper also discusses the implementation details encountered during the construction of this system in the PROLOG programming language. GRA

N85-33837# Lopez Energy Alternatives Project, Wash.
LOPEZ ENERGY ALTERNATIVES PROJECT Final Report
R. B. Forbes [1985] 9 p
(Contract DE-FG06-80RO-00498)
(DE85-010589; DOE/RO-00498/T1) Avail: NTIS HC A02/MF A01

The activities reported include: purchase of books and periodical subscriptions on energy related topics for a community library; organization of energy related workshops; and monitoring of solar radiation and wind. DOE

N85-33838# Colorado Div. of Highways, Denver. Div. of Transportation Planning.
TECHNOLOGY TRANSFER SYSTEM AUTOMATION IMPLEMENTATION Final Report
E. M. Bullard Oct. 1984 27 p
(Contract DTFH68-83-P-70115)
(PB85-177335; CDOH-DTP-R-84-20) Avail: NTIS HC A03/MF A01 CSCL 05B

The Technology Transfer Unit of the Colorado Department of Highways maintains a technical library consisting of research and technical reports from varied sources. The implementation of an automated data base management program to file the reports as well as supporting information on each report such as distribution information and comments is detailed. Objectives, observations and an appendix with instructions to the system's operations as currently set up are included. Author (GRA)

N85-33839# National Bureau of Standards, Gaithersburg, Md.
NBS (NATIONAL BUREAU OF STANDARDS) LIBRARY SERIAL HOLDINGS, 1985
M. L. Kingston Feb. 1985 229 p
(PB85-191948; NBSIR-84-2922) Avail: NTIS HC A11/MF A01 CSCL 05B

This publication contains holdings information for approximately 4,600 titles held in the NBS Library, representing current and noncurrent journals, periodicals, annuals, memoirs, proceedings, and transactions. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-33840* National Aeronautics and Space Administration, Washington, D. C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 1: ABSTRACTS (SUPPLEMENT 27)
Jul. 1985 47 p
(NASA-SP-7039(27)-Section-1; NAS 1.21:7039(27)-Section-1) Avail: NTIS HC $10.00 (special price) CSCL 05D

Abstracts are provided for 92 patents and patent applications entered into the NASA scientific and technical information system during the period January 1985 through June 1985. Each entry consist of a citation, and abstract, and in most cases, a key illustration selected from the patent or patent application. Author

N85-33841*# Meridian Corp., Falls Church, Va.
FEDERAL EXPORT ASSISTANCE PROGRAMS APPLICABLE TO THE US PHOTOVOLTAIC INDUSTRY Final Report
J. Hogan, B. Macaleer, and S. Enfield (US Export Council for Renewable Energy) Jan. 1985 107 p refs Sponsored by NASA Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-CR-176114; JPL-9950-1003; NAS 1.26:176114; DOE/JPL-956685-02) Avail: NTIS HC A06/MF A01 CSCL 05A

A comprehensive review of key federal programs and services available to assist U.S. photovoltaic firms in exporting is presented. It contains an in-depth discussion of the eight major agencies offering export assistance: the Agency for International Development, the Department of Agriculture, the Department of Commerce, the Export-Import Bank, the Office of the U.S. Trade Representative, the Overseas Private Investment Corporation, the Small Business Administration, and the Trade and Development Program. Additionally, it presents brief discussions of relevant activities performed by other federal agencies that can assist PV exporters. Specific information provided for each of these agencies includes: an overview of the agency mission; a summary of export related programs and services; and identification of important agency contacts, including names, addresses and telephone numbers; a discussion of the agency's renewable energy experience; and relevant agency budget data. Author

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-33842# Argonne National Lab., Ill.
ELECTRIC VEHICLE OPERATIONS BY THE CITY OF HUNTSVILLE, ALABAMA, MARCH 1983 - MAY 1984
D. Wanish and S. LaBelle Sep. 1984 33 p
(Contract W-31-109-eng-38)
(DE85-005913; ANL/CNSV-TM-150) Avail: NTIS HC A03/MF A01

The City of Huntsville, Alabama, has operated seven electric vehicles since late 1982 and is participating in a test and evaluation program. Vehicle activity from March 1983 to May 1984 is summarized, including daily travel, energy use, monthly vehicle utilization, and battery life. Data from the Huntsville fleet are compared with comparable information from three other electric vehicle fleets participating in the DOE program. A subcontract with the University of Alabama at Huntsville provided technical assistance and personnel training during the initial operating period. The first year of operation after the break in period is covered. In general, the Huntsville fleet provided an excellent test of real world electric vehicle operation and yielded a number of design improvements as well. Many changes were implemented in the vehicles and in specific components, such as controllers. DOE

N85-33843# Van der Meer en Van Tilburg, Innovatie Adviesburo, Enschede (Netherlands).
NEW INNOVATIVE BUSINESSES FROM INDUSTRY. EXPERIENCES IN THE NETHERLANDS IN THE SUCCESSFUL TRANSFER OF TECHNOLOGY FROM UNIVERSITY TO INDUSTRY
J. J. vanTilburg Nov. 1984 13 p Prepared in cooperation with Technische Hogeschool, Twente, Netherlands
Avail: NTIS HC A02/MF A01

The experience of graduates starting businesses, the attitudes

of graduates to setting up their own companies, and the Twente Technical Institute (Holland) start-up policy were surveyed. Of 95 companies founded between 1977 and 1980, 82 are still active. About 50% are management or technical consultancies, 30% computer hardware or software production, and 13% manufacturing of other products. Author (ESA)

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N85-33131# Joint Publications Research Service, Arlington, Va.
SALYUT-7 COSMONAUTS WORK WITH RS-17 AND GSPS X-RAY TELESCOPES
A. Pokrovskiy *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 32-33 Transl. into ENGLISH from Pravda (Moscow), 21 Sep. 1984 p 6 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33132# Joint Publications Research Service, Arlington, Va.
COMMENTS ON RS-17 X-RAY TELESCOPE Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 34 Transl. into ENGLISH from Vyshka (Baku), 6 Oct. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33133# Joint Publications Research Service, Arlington, Va.
ASTRON TELESCOPE STABILIZATION SYSTEM Abstract Only
G. Tovmasyan *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 42 Transl. into ENGLISH from Kommunist (Moscow), 15 Aug. 1984 p 2 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33134# Joint Publications Research Service, Arlington, Va.
RESULTS FROM ASTRON ORBITING TELESCOPE Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 43 Transl. into ENGLISH from Sov. Kirgiziya (Frunze, USSR), 20 Sep. 1984 p 2 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33136# Joint Publications Research Service, Arlington, Va.
RADIO TELESCOPE WITH 256 ANTENNAS BUILT IN SIBERIA Abstract Only
In its USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 46 Transl. into ENGLISH from Leningr. Pravda (Leningrad), 7 Oct. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

N85-33137# Joint Publications Research Service, Arlington, Va.
ASTRON X-RAY EXPERIMENT
V. G. Kurt and Ye. K. Sheffer *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 47-57 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 2, Mar. - Apr. 1984 p 26-34 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-33844# Consiglio Nazionale delle Ricerche, Frascati (Italy). Ist. di Fisica dello Spazio Interplanetario.
SPECTRAL MEASUREMENTS OF MAGNETIC ENERGY AND MAGNETIC HELICITY BETWEEN 0.29 AND 0.97 AU
R. Bruno and M. Dobrowolny Feb. 1985 29 p refs
(IFSI-85-2) Avail: NTIS HC A03/MF A01

Results on the spectra of magnetic helicity and magnetic energy as a function of radial distance from the Sun obtained through HELIOS A and B data in the range 0.3 to 1 AU are presented. The time intervals were chosen within the trailing edge of two different streams observed by the two spacecraft at different heliocentric distances. These periods were homogeneously characterized by almost incompressible Magnetohydrodynamic MHD fluctuations. Results show a steepening of the magnetic helicity spectra similar to that of the magnetic energy spectra by increasing the radial distance from the Sun. The indexes of the magnetic helicity spectra are systematically higher than those of the magnetic energy spectra. The correlation lengths for magnetic helicity are also higher than those of magnetic energy. A radial evolution of these correlation lengths is found. Results indirectly confirm the inverse cascade hypothesis for magnetic helicity. Author (ESA)

N85-33845# Danish Meteorological Inst., Copenhagen. Div. of Geophysics.
INTERPLANETARY MAGNETIC FIELD CONTROL OF HIGH-LATITUDE ELECTRIC FIELDS AND CURRENTS DETERMINED FROM GREENLAND MAGNETOMETER DATA
E. Friis-Christensen, Y. Kamide (Kyoto Sangyo Univ., Japan), A. D. Richmond (NOAA, Boulder, Colo.), and S. Matsushita (National Center for Atmospheric Research) 1984 36 p refs Submitted for publication Sponsored by Danish Research Board, UK Science and Engineering Research Council, NSF, National Academy of Sciences and National Institute of Polar Research
(DMI-Geophys-Papers-R-69; ISBN-87-7478-223-1) Avail: NTIS HC A03/MF A01

To determine the effects of the interplanetary magnetic field (IMF) on electric potential and on ionospheric and field aligned currents, a numerical algorithm was applied to an empirical model of high latitude magnetic perturbations, parameterized in terms of the By and Bz components of the IMF. Results indicate that the system of ionospheric and Birkeland currents near the polar cusp exists independently of the system of region 1 and region 2 field-aligned currents, which depends strongly on Bz. The direction of the field-aligned currents in the dayside polar cap is upward currents for $By > 0$ in the northern polar cap and oppositely directed for $By < 0$. At the dayside boundary of the polar cap the ionospheric Hall current is sandwiched between the polar cap field aligned currents and an oppositely directed field aligned current sheet on the equatorward side. For $Bz > 0$ and By small, the ionospheric and field aligned currents are localized near the dayside polar cusp, and the electric field has a dusk dawn component in a narrow region near magnetic local noon in agreement with satellite measurements. Author (ESA)

N85-33138# Joint Publications Research Service, Arlington, Va.
PROGRAM FOR OBSERVATIONS OF HALLEY'S COMET
Ya. S. Yatskiv and K. I. Churyumov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 58-60 Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 1, Jan. - Feb. 1984 p 35-39 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N85-33846*# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
ANALYSIS OF JOVIAN DECAMETRIC DATA: STUDY OF RADIO EMISSION MECHANISMS Progress Report, 15 Sep. 1984 - 15 Mar. 1985
David H. Staelin and Tomas A. Arias 6 Aug. 1985 12 p refs (Grant NAGw-373)
(NASA-CR-176057; NAS 1.26:176057) Avail: NTIS HC A02/MF A01 CSCL 03B

Data gathered by the Voyager 1 and Voyager 2 Planetary Radio Astronomy Experiments (PRA) are unique in many ways including their frequency range, time resolution, polarization information and geometric characteristics. Studies of rapidly varying phenomena have thus far been hampered by paper display techniques which require large amounts of paper to exploit the full PRA time resolution. A software package capable of effectively displaying full 6s resolution PRA dynamic spectra on a high quality video monitor while compensating for the aforementioned variations was developed. The most striking phenomena revealed by the new display techniques is called Modulated Spectral Activity (MSA) because of its appearance in dynamic spectra as a series at least two parallel emission bands which drift back and forth in frequency on time scales of tens of seconds. In an attempt to locate and understand the MSA source mechanism, a catalogue has been compiled of the start and end of all known MSA events. B.W.

N85-33847*# Georgia Inst. of Tech., Atlanta. School of Electrical Engineering.
LABORATORY EVALUATION AND APPLICATION OF MICROWAVE ABSORPTION PROPERTIES UNDER SIMULATED CONDITIONS FOR PLANETARY ATMOSPHERES Semiannual Status Report, 1 Feb. - 31 Jul. 1985
Paul G. Steffes 31 Jul. 1985 50 p refs
(NASA-CR-176078; NAS 1.26:176078; SASR-3) Avail: NTIS HC A03/MF A01 CSCL 03B

Radio absorptivity data for the Venus middle atmosphere (1 to 6 atm, temperatures from 500 to 575K) obtained from spacecraft radio occultation experiments (at 3.6 to 13.4 cm wavelengths) and earth-based radio astronomical observations (1 to 3 cm wavelength range) are compared to laboratory observations at the latter wavelength range under simulated Venus conditions to infer abundances of microwave-absorbing atmospheric constituents, i.e. H2SO4 in a CO2 atmosphere. F.M.R.

N85-33848*# Atmospheric and Environmental Research, Inc., Cambridge, Mass.
EXTENDED ATMOSPHERES OF OUTER PLANET SATELLITES AND COMETS Annual Report, 1 Aug. 1984 - 31 Jul. 1985
William H. Smyth and Michael R. Combi Aug. 1985 54 p refs (Contract NASw-3966)
(NASA-CR-176137; NAS 1.26:176137) Avail: NTIS HC A04/MF A01 CSCL 03B

Model analysis of the extended atmospheres of outer planet satellites and comets are discussed. Understanding the neutral hydrogen distribution in the Saturn system concentrated on assessing the spatial dependence of the lifetime of hydrogen atoms and on obtaining appropriately sorted Lyman ALPHA data from the Voyager 1 UVS instrument. Progress in the area of the extended cometary atmospheres included analysis of Pioneer Venus Layman alpha observations of Comet P/Encke with the fully refined hydrogen cloud model, development of the basic carbon and oxygen models, and planning for the Pioneer Venus UVS observations of Comets P/Giacobini-Zinner and P/Halley. Author

N85-33849*# Lunar and Planetary Inst., Houston, Tex.
TERRESTRIAL PLANETS: COMPARATIVE PLANETOLOGY Abstracts Only
1985 30 p refs Conf. held in Pasadena, Calif., 5-7 Jun. 1985; sponsored by the American Geophysical Union, American Astronomical Society, Geological Society of America, Lunar and Planetary Inst., Planetary Society, and California Inst. of Tech.
(Contract NASw-3389)
(NASA-CR-176093; NAS 1.26:176093; LPI-Contrib-569) Avail: NTIS HC A03/MF A01 CSCL 03B

Papers were presented at the 47th Annual Meteoritical Society Meeting on the Comparative planetology of Terrestrial Planets. Subject matter explored concerning terrestrial planets includes: interrelationships among planets; plaentary evolution; planetary structure; planetary composition; planetary Atmospheres; noble gases in meteorites; and planetary magnetic fields. For individual titles, see N85-33850 through N85-33895.

N85-33850*# Chicago Univ., Ill. Enrico Fermi Inst.
NOBLE GASES IN METEORITES AND TERRESTRIAL PLANETS Abstract Only
J. F. Wacker *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 1 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Terrestrial planets and chondrites have noble gas platforms that are sufficiently alike, especially Ne/Ar, that they may have acquired their noble gases by similar processes. Meteorites presumably obtained their noble gases during formation in the solar nebula. Adsorption onto C - the major gas carrier in chondrites - is the likely mechanism for trapping noble gases; recent laboratory simulations support this hypothesis. The story is more complex for planets. An attractive possibility is that the planets acquired their noble gases in a late accreting veneer of chondritic material. In chondrites, noble gases correlate with C, N, H, and volatile metals; by Occam's Razor, we would expect a similar coupling in planets. Indeed, the Earth's crust and mantle contain chondritic like trace volatiles and PL group metals, respectively and the Earth's oceans resemble C chondrites in their enrichment of D (8X vs 8-10X of the galactic D/H ratio). Models have been proposed to explain some of the specific noble gas patterns in planets. These include: (1) noble gases may have been directly trapped by preplanetary material instead of arriving in a veneer; (2) for Venus, irradiation of preplanetary material, followed by diffusive loss of Ne, could explain the high concentration of AR-36; (3) the Earth and Venus may have initially had similar abundances of noble gases, but the Earth lost its share during the Moon forming event; (4) noble gases could have been captured by planetestimals, possibly leading to gravitational fractionation, particularly of Xe isotopes and (5) noble gases may have been dissolved in the hot outer portion of the Earth during contact with a primordial atmosphere. B.W.

N85-33851*# California Univ., Los Angeles.
RELATIONSHIPS BETWEEN CHONDRITIC METEORITES AND PLANETS Abstract Only
John T. Wasson *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 1 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Chondrites formed in the solar nebula prior to the formation of planets; they probably constituted the bulk of preplanetary solids in the inner solar system. In the highly reduced enstatite chondrites 10% of Si is metallic; in the highly oxidized CM and CI chondrites 20-30% of Fe is in the +3 state. The high density of Mercury implies that nebular Fe was reduced, whereas the low density of Mars indicates that a large fraction was oxidized. Most rare gases in the terrestrial planets seem to have accreted trapped in grains; Venusian interelement ratios resemble those in enstatite chondrites; Earth and Mars ratios are more like those in ordinary or car-

bonaceous chondrites. These observations imply that enstatite chondrites formed near the Sun (near Venus?), the carbonaceous chondrites formed far from the Sun, the ordinary chondrites at an intermediate location. Compositional data on Mercury, comets, an asteroidal fragment, and the moons of Mars are badly needed. B.W.

N85-33852*# Tokyo Univ. (Japan). Geophysics Inst.
TERRESTRIAL Xe ISOTOPIC CONTRAINTS ON THE EARLY HISTORY OF THE EARTH Abstract Only
M. Ozima, F. A. Podosek (Washington Univ., St. Louis), and G. Igarashi *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 2 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The available data on Xe isotopic compositions in terrestrial materials are examined. Their constraints on the early history of the Earth are discussed. B.W.

N85-33853*# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
NOBLE GAS PATTERNS IN THE ATMOSPHERES OF MARS AND EARTH: A COMPARISON VIA THE SNC METEORITES Abstract Only
R. O. Pepin and R. H. Becker *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 2 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Noble gas and nitrogen compositions in the glassy phase of the EETA 79001 shergottite correspond closely with Viking measurements. This direct evidence for the origin of the SNC meteorites on Mars, and for trapping of an unfractionated sample of Martian atmospheric gases in the 79001 glass, provides a reasonable basis for comparing the Martian and terrestrial atmospheres with more precision than that afforded by the Viking data set. Results are that, with one exception, elemental and isotopic compositions of nonradiogenic Martian noble gases are similar to those in the Earth's atmosphere; relatively small isotopic discrepancies in Kr and perhaps Xe may be attributable to different degrees of mass fractionation of a common parent reservoir. The anomaly is in Ar composition, where Martian Ar-36/AR-38 approx. 4 is strikingly lower than the values near 5.3 that characterize both the Earth and major meteoritic gas carriers. Although a primordial Martian ratio of 5.3 could in principle be altered by some planet specific process (e.g., cosmic ray spallation of surface materials) operating over geologic time, one has not been found that works. B.W.

N85-33854*# Massachusetts Univ., Amherst.
OXIDATION STATES OF IRON IN THE TERRESTRIAL PLANETS: EVIDENCE AND IMPLICATIONS FOR ACCRETION MODELS Abstract Only
R. L. Huguenin and S. L. Harris *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 3 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Analyses of Mars spectra reveal that primary minerals may be more iron rich than average basalts on Earth, and the oxidation state of iron in the pyroxines suggests equally high or higher oxygen fugacities on Mars than Earth. Analysis of Mercury spectra reveal that silicate iron contents are substantially lower than those on Mars. Mercury, however, probably has a substantial iron core. This is consistent with a lower oxidation state of iron on Mercury than on Mars. These findings are consistent with predictions of models of equilibrium condensation and homogeneous accretion. Those models predict that Mercury would have negligible Fe(2+) in silicates (Fe/Fe+Mg approx. 0.5). For Mercury iron should be virtually all metallic, while for Mars the iron would be all oxidized as FeS and silicate. Surface measurements of Fe/Fe+Mg on Venus, Earth, and Mars further support the predicted relative increase in Fe/Fe+Mg ratio (increased oxidation state) with distance from the Sun. The implied high oxygen fugacities on Mars (Fe(3+) in silicates) provide additional consistence with the model predictions. B.W.

N85-33855*# Iowa State Univ. of Science and Technology, Ames. Dept. of Earth Sciences.
NEBULAR VOLATILE FRACTIONATIONS ASSOCIATED WITH CHONDRULE FORMATION Abstract Only
Alfred Kracher *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 3 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Chondrules are ubiquitous constituents of primitive solar system matter, indicating that chondrule formation was an important and widespread process in the early history of the solar system. If chondrules formed from fine grained CI like precursors, some volatile fractionation must have accompanied chondrule formation. This is not likely related to a separation of chondrules from gas (and dust, fine enough to be coupled to gas) shortly after formation, a process required by most models of chondrule formation. If chondrules are continuously formed in and removed from a region of the solar nebula, the chemical environment in this region will change. Vaporization of solid increases both oxygen and sulfur in the gas relative to H. Depending on the oxygen/sulfur ratio, which may vary widely as a function of precursor composition and temperature, two cases can be distinguished: (1) sulfur requires reaction with solid to condense, and thus may become much more enriched than 0; (2) if a significant amount of silicate is vaporized together with sulfides and does not recondense, changes in H/O outweigh S enrichment. In combination, these two effects may be able to account for much of the chemical variation among various types of chondrites. Opaque, fine grained matrix in unequilibrated chondrites, which is thought to derive from dust, has indeed been found to have a volatile element abundance complementary to chondrules. B.W.

N85-33856*# Hawaii Univ., Honolulu. Planetary Geosciences Div.
THE DISTRIBUTION OF COMPOSITIONAL CLASSES IN THE ASTEROID BELT: A COSMOCHEMICAL FINGERPRINT? Abstract Only
J. Gradie *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 4 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Studies of the physical properties of the asteroids show a nonrandom distribution of types across the belt for asteroid classes E, S, M, F, C, P, and D. The general trend is for asteroids in the inner belt to have higher albedos and stronger mafic silicate absorption features than those asteroids located further out in the belt. One interpretation of this trend is that the asteroids, which occupy the region between the silicate rich terrestrial planets and the volatile rich outer planets, have preserved in their heliocentric compositional distribution a cosmochemical fingerprint of the thermodynamic conditions present in the solar nebula at the time of their formation. This hypothesis predicts that the differences in the spectral properties among the low albedo classes (C, P, F, P, and D) are due to temperature controlled processes which formed carbonaceous opaques. If this is true then the exact composition of the opaque components could, in principle, be used to determine the thermodynamic conditions between the orbits of Mars and Jupiter during the formation of the asteroids. Author

N85-33857*# Planetary Science Inst., Tucson, Ariz.
LATE-STAGE PLANETESIMALS: HOW BIG? Abstract Only
R. Greenberg, D. R. Davis, C. R. Chapman, and S. J. Weidenschilling *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 4 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Numerical simulation of the early stages of planet growth show that a few bodies nearly 1000 km in diameter may have formed within approx. 100,000 yr after solid material grew into km scale planetesimals by gravitational instability. Even after such large

bodies formed, the bulk of the mass of the future terrestrial planet zone resided in small bodies. Subsequent evolution is difficult to model because it requires simultaneous consideration of continuum (multitudinous small bodies) and discrete (a few large bodies) evolution. Some relevant issues include definition of accretional feeding zones, evaluation of the range of gravitational influence, viscous transport and diffusion, orbital commensurabilities, role of gas, etc. The first large bodies may have been (1) the embryos of the final planets, which grew by accreting tiny planetesimals, or (2) merely the first of many 1000+ km bodies, which grew independently and later collided to form the planets. Models of late stage accretion that assume all bodies to be initially nearly Moon sized provide insight into relevant collisional and dynamical processes. The chief point in this research is that the correct size distribution during the later stages of planet growth remains unknown. B.W.

N85-33858*# California Univ., San Diego, La Jolla.
WHAT DETERMINES THE LOCATION OF SATELLITES AND PLANETS? Abstract Only
G. Arrhenius *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 5 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The discrete structural pattern in the distribution of the satellites and planets around their primaries has since its discovery been thought to hold the key to the origin and evolution of the solar system. Different attempts to rationalize this distribution are reviewed with emphasis on theories with foundation in verifiable physical processes. Foremost among these is the band structure theory, which relates the emplacement of interstellar dust and gas source material around the magnetized primarily to the critical velocity for ionization of the four major interstellar gas components. The uncertainties, that are inevitable in all reconstructions, are in this theory compensated by the support from precise manifestations of the 2/3 effect in the Saturnian ring system and in the asteroid belt, and by the reproduction of related phenomena in laboratory and space experiments. Author

N85-33859*# Osmania Univ., Hyderabad (India). Dept. of Geology.
INTERRELATIONSHIPS AMONG THE TERRESTRIAL PLANETS Abstract Only
A. S. P. Rao *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 5 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The spatial distribution of mass in the solar system provides invaluable clues pertaining to the condensation history of the solar nebula, to the sequence of condensation of minerals and metal alloys in different P-T Regimes in the nebula and to the time sequence in the nucleation of planetary iron cores. Massive planets (Earth & Venus) were due to the twin processes of early nucleation of iron into massive cores and late termination of accretion processes which resulted in the accretion of volatile rich materials also. This paper maintains that the accretionary features (High-lands, basins/craters) are present on all the planets and the thermally controlled tectonic styles (Rifts, fracture zones, volcanic plains, Canyons, trenches, domes, etc.) are essentially of same origin but are of different magnitude and the interactions of degassed volatiles (atmosphere together with hydrosphere) with the lithosphere are dictating and diversifying the tectonic style on the Earth. B.W.

N85-33860*# Arizona Univ., Tucson. Lunar and Planetary Lab.
IMPACT PROCESSES AND THEIR IMPLICATIONS FOR PLANETARY FORMATION AND EARLY EVOLUTION Abstract Only
H. J. Melosh *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 6 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Small impact craters dominate the geomorphology of small planetary bodies. Even Mars has extensive impact-dominated landscapes. The regoliths of the Moon and asteroids are created and maintained by impacts. It is now widely recognized that large impacts (craters 100-1000 km in diameter) are one of the major tectonic elements in the lithospheres of bodies like the Moon, Mercury, Mars and Callisto. The multiring basins these large impacts produce sometimes extend over an entire hemisphere. Such basins may have also affected tectonics during the Earth's hadean era. Although it has long been appreciated that low velocity collisions played a major role in the accretion of planetesimals into planets, recent work indicates a far more profound role for impacts. Studies of the interaction of planetary atmospheres with large impacts, begun in an effort to define the climatological effects of the K-T impactor, suggest that impacts may remove a significant fraction of a planet's atmosphere. Such removal now offers hope of explaining the puzzling systematics of the heavy noble gases in the atmospheres of the Earth, Venus, and Mars. B.W.

N85-33861*# Planetary Science Inst., Tucson, Ariz.
QUESTIONS ABOUT MERCURY'S ROLE IN COMPARATIVE PLANETARY GEOPHYSICS Abstract Only
C. R. Chapman, S. J. Weidenschilling, D. R. Davis, R. Greenberg, and M. A. Leake (Valdosta State College) *In* Lunar and Planetary Inst. Terrest Planets: Comp. Planetology 1985 p 6 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Problems which have arisen in formulating a mutually consistent picture of Mercury's evolution are outlined. It appears that one or more of the following widely adopted assumptions are wrong about Mercury: (1) its original composition at least approximately resulted from equilibrium condensation; (2) its magnetic field arises from a still-active dynamo; (3) its thermal evolution should have yielded early core formation followed by cooling and a global contraction approaching 20 km in the planet's radius; (4) Mercury's surface is basaltic and the intercrater plains are of volcanic origin. It is suggested that Mercury's role in comparative planetology be reevaluated in the context of an alternative timescale based on the possibility that Mercury was subjected to a continuing source of cratering projectiles over recent aeons, which have not impacted the other terrestrial planets. Although such vulcanoids have not yet been discovered, the evolution of Mercury's orbit due to secular perturbations could well have led to a prolonged period of sweeping out any intra-Mercurian planetesimals that were originally present. Mercury's surface could be younger than previously believed, which explains why Mercury's core is still molten. E.A.K.

N85-33862*# California Inst. of Tech., Pasadena.
VOLATILE LOSS FOLLOWING VERY LARGE IMPACTS Abstract Only
D. J. Stevenson *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 7 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Large impacts on growing planets can be fundamentally different in outcome than small impacts because they can lead to a planet-enveloping cloud of siliate vapor with a radiative cooling time long compared to dynamic time scales. Under these circumstances, there can be preferrential volatile loss by hydrodynamic outflow immediately above the silicate cloud deck. This loss is in ddition to the prompt, nonpreferential loss immediately following the impact event. During this time, evaporative loss (Jeans loss) can be $>$ 0.00001 of the planetary mass, provided the impact has substantial angular momentum and a magma disk forms. The loss is preferentially fromt he extremities of the disk and can be easily s100 bar-equivalents of CO2 or H2O. This implies devolatilization of Moon-forming material in an impact origin and may have important implications for the CO2 reservoirs of Venus, Earth, and Mars. E.A.K.

N85-33863*# Tokyo Univ. (Japan).
ORIGIN OF THE ATMOSPHERE AND HYDROSPHERE OF THE TERRESTRIAL PLANETS Abstract Only
Takafumi Matsui and Yutaka Abe *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 7 (For primary

document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

An early thermal evolution of a planet growing by planetesimal impacts was studied. An evolution of an impact induced atmosphere was considered. It is known that the surface of a growing planet is heated due to the blanketing effect of the atmosphere and exceeds the melting temperature, which means that the surface of a growing planet was entirely covered by a magma ocean. The amount of water in a proto-atmosphere is influenced by the formation of a magma ocean. It is suggested the solubility of water in silicate melt controls the water content in a proto-atmosphere. It is noted that irrespective of difference in initial water content of planetesimals the final water content in the atmosphere becomes almost constant and is about 10 to the 21st power kg which is almost identical with the present amount of the ocean. It is also shown that the water in a proto-atmosphere can be liquid for the Earth and becomes to be an ocean but this does not happen on Venus. E.A.K.

N85-33864*# Alfred-Wegener-Inst. for Polar Research, Bremerhaven (West Germany).
AN IMPACT-INDUCED TERRESTRIAL ATMOSPHERE AND IRON-WATER REACTIONS DURING ACCRETION OF THE EARTH Abstract Only
M. A. Lange and T. J. Ahrens (California Inst. of Tech., Pasadena) *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 8 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Shock wave data and theoretical calculations were used to derive models of an impact-generated terrestrial atmosphere during accretion of the Earth. The models showed that impacts of infalling planetesimals not only provided the entire budget of terrestrial water but also led to a continuous depletion of near-surface layers of water-bearing minerals of their structural water. This resulted in a final atmospheric water reservoir comparable to the present day total water budget of the Earth. The interaction of metallic iron with free water at the surface of the accreting Earth is considered. We carried out model calculations simulating these processes during accretion. It is assumed that these processes are the prime source of the terrestrial FeO component of silicates and oxides. It is demonstrated that the iron-water reaction would result in the absence of atmospheric/hydrospheric water, if homogeneous accretion is assumed. In order to obtain the necessary amount of terrestrial water, slightly heterogeneous accretion with initially 36 wt% iron planetesimals, as compared with a homogeneous value of 34 wt% is required. E.A.K.

N85-33865*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CLIMATIC CONSEQUENCES OF VERY HIGH CO2 LEVELS IN EARTH'S EARLY ATMOSPHERE Abstract Only
J. F. Kasting *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 8 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Earth has approximately 60 bars of carbon dioxide tied up in carbonate rocks, or roughly 2/3 the amount of CO2 of Venus' atmosphere. Two different lines of evidence, one based on thermodynamics and the other on geochemical cycles, indicate that a substantial fraction of this CO2 may have resulted in the atmosphere during the first few hundred million years of the Earth's history. A natural question which arises concerning this hypothesis is whether this would have resulted in a runaway greenhouse affect. One-dimensional radiative/convective model calculations show that the surface temperature of a hypothetical primitive atmosphere containing 20 bars of CO2 would have been less than 100C and no runaway greenhouse should have occurred. The climatic stability of the early atmosphere is a consequence of three factors: (1) reduced solar luminosity at that time; (2) an increase in planetary albedo caused by Rayleigh scattering by CO2; and (3) the stabilizing effects of moist convection. The latter two factors are sufficient to prevent a CO2-induced runaway greenhouse on the present Earth and for CO2 levels up to 100 bars. It is determined whether a runaway greenhouse could have occurred during the latter stages of the accretion process and, if so, whether it would have collapsed once the influx of material slowed down. E.A.K.

N85-33866*# California Inst. of Tech., Pasadena.
THE POLAR CAPS AND THE CLIMATIC EVOLUTION OF MARS Abstract Only
David A. Paige *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 9 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Mars and Earth experience quasiperiodic variations in the distribution of incident solar radiation due to secular perturbations in their orbital and axial elements. On Mars, the potential climatic effects of these perturbations are large because the mass of the Martian atmosphere may be determined by the vapor pressures of semipermanent CO2 frost deposits at the poles. The Viking Orbiter observations of the Martian polar caps suggest that the sensitivity of the Martian climate system to the variations in the polar insolation may be considerably reduced by the tendency for polar frost deposits to become brighter with increasing rates of incident solar radiation. This phenomenon can be explained by the tendency for dust particles to sink into CO2 frost at rates that depend on the magnitude of the incident solar flux. E.A.K.

N85-33867*# Max-Planck-Inst. fuer Chemie, Mainz (West Germany).
BIOLOGICAL MODULATION OF PLANETARY ATMOSPHERES: THE EARLY EARTH SCENARIO Abstract Only
M. Schidlowski *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 9 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The establishment and subsequent evolution of life on Earth had a profound impact on the chemical regime at the planet's surface and its atmosphere. A thermodynamic gradient was imposed on near-surface environments that served as the driving force for a number on important geochemical transformations. An example is the redox imbalance between the modern atmosphere and the material of the Earth's crust. Current photochemical models predict extremely low partial pressures of oxygen in the Earth's prebiological atmosphere. There is widespread consensus that any large-scale oxygenation of the primitive atmosphere was contingent on the advent of biological (autotrophic) carbon fixation. It is suggested that photoautotrophy existed both as a biochemical process and as a geochemical agent since at least 3.8 Ga ago. Combining the stoichiometry of the photosynthesis reaction with a carbon isotope mass balance and current concepts for the evolution of the stationary sedimentary mass as a funion of time, it is possible to quantify, the accumulation of oxygen and its photosynthetic oxidation equivalents through Earth history. E.A.K.

N85-33868*# Arizona Univ., Tucson.
VOLATILES ON SATELLITES OF THE OUTER SOLAR SYSTEM Abstract Only
J. I. Lunine *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 10 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Molecules of cosmochemically abundant elements can act as volatiles and hence play a dominant role in the climatic and surficial evolution of solid bodies. Examples on terrestrial planets are H2O on Earth and H2O and CO2 on Mars. Analogous processes in the outer solar system focussing on CH4, its associated hydrocarbons, and N2 on Titan and Triton, the large moons of Saturn and Neptune were explored. A kilometer-deep C2H6-CH4 ocean was proposed for the surface of Titan to reconcile data on the lower atmosphere with understanding of the photochemical conversion of methane to heavier hydrocarbons. If such ocean exists, then it has dissolved in it an amount of N2 equal to the present atmospheric abundance. Since N2 contributes with CH4 a substantial greenhouse effect, the atmospheric physical and

chemical characteristics are strongly coupled to those of the ocean, which change with time as methane is photolyzed in the stratosphere. Some relationship exists to the runaway greenhouse model for primordial Venus and the possible climatic implications of the buffering of Earth's atmospheric CO2 by the oceans. Two important diagnostics, measurable in Titan's atmosphere, of the conditions under which icy satellites formed are the abundances of noble gases and the CHd/CH4 radio. Both of these indicators have been altered during the evolution of Titan's surface-atmosphere system, the former by interaction with the ocean and the latter by progressive photolysis of methane into heavier hydrocarbons. The physical state and composition of volatiles on the surface of Triton is controversial, but plausibly could include CH4 N2 and perhaps CO. If condensed CH4 and N2 are widespread, their transformation to and from the vapor phase dominates the surface energy balance with sunlight. The extreme seasonal modulation of subsolar latitude on Triton is thus primarily expressed by volatile transport rather than large teperature changes, with possibly drastic observational consequences. The presence of two volatile species differing greatly in their vapor pressures make Triton a crude analog of Mars. Triton might be more appropriately regarded as a deep-freeze version of Titan. E.A.K.

N85-33869*# Arizona State Univ., Tempe. Center for Meteorite Studies.

PLANETARY SURFACE PROCESSES: A REVIEW Abstract Only

R. Greeley *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 10 (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

The Earth's surface was shaped by a variety of processes, including volcanism, tectonism, impact cratering, and gradation. Solar System exploration and geological mapping showed that these processes operate on all the terrestrial planets. Gradation is a complex process that begins with weathering and erosion, continues with transport of weathered debris, and ends with deposition. Gradation works through the agents of gravity, wind, and water, and can shed light on planetary surface evolution. Rates of surface erosion vary with planet and must be considered in assessing ages of surface units based on impact crater frequency distributions. The products of gradation may substantially influence remote sensing signatures for determination of composition and must be taken into account in interpreting such data. E.A.K.

N85-33870*# Technische Univ., Clausthal-Zellerfeld (West Germany). Geological Inst.

PERMAFROST FEATURES ON EARTH AND MARS: SIMILARITIES, DIFFERENCES Abstract Only

H.-P. Joens *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 11 (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

Typical permafrost features on Earth are polygonal structures, pingos and soli-/gelifluxion features. In areas around the poles and in mountain ranges the precipitation accumulates to inland ice or ice streams. On Mars the same features were identified: polygonal features cover the larger part of the northern lowlands indicating probably an ice wedge-/sand wedge system or desiccation cracks. These features indicate the extend of large mud accumulations which seem to be related to large outflow events of the chaotic terrains. The shore line of this mud accumulation is indicated by a special set of relief types. In some areas large pingo-like hills were identified. In the vicinity of the largest martian volcano, Olympus Mons, the melting of underlying permafrost and/or ground ice led to the downslope sliding of large parts of the primary shield which formed the aureole around Olympus Mons. Glacier-like features are identified along the escarpment which separates the Southern Uplands from the Northern Lowlands. E.A.K.

N85-33871*# Jet Propulsion Lab., La Canada, Calif.

INTERPRETATION OF PHOTOMETRIC MEASUREMENTS OF AIRLESS BODIES Abstract Only

B. J. Buratti and R. M. Nelson *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 11 refs (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

The scattering properties of the surfaces of airless bodies were observed. These properties are controlled primarily by the following physical parameters: the single scattering albedo, the single particle phase function, the porosity of the upper regolith, and large scale roughness. Comparison of the observations with scattering models reveals both similarities and differences among the airless bodies in the solar system. The textural characteristics of the regolithms of icy satellites appear to be generally similar to those of the Moon and Mercury; differences in the scattering functions are attributed to albedo alone. A notable exception is Europa, which has a much more compact regolith. Io has an especially porous regolith, with void space of about 90%. Although the solar phase curves of the Moon and Mercury are similar, Mercury's phase curve drops off less rapidly at solar phase angles greater than 100 degrees. It is suggested that the Moon is rougher at scales larger than a few mm. E.A.K.

N85-33872*# Vrije Universiteit, Amsterdam (Netherlands).

INTERRELATIONS FOR THE ELEMENTS OF THE SCATTERING MATRIX Abstract Only

J. W. Hovenier, H. C. vandeHulst (Leiden Observatory), and C. V. M. vanderMee (Texas Technological Univ.) *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 12 (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

Light scattered by molecules and particulate matter in planetary atmospheres was analyzed. The 4x4 scattering matrix that transforms the Stokes parameters of the incident beam into those of the scattered beam is discussed. Elementary methods are described to obtain interrelations for the 16 elements of the scattering matrix, when light is scattered by a particle of arbitrary size, shape and composition or by a collection of such particles. The implications of the results for the interpretation of polarimetric data of planets with an atmosphere are outlined. E.A.K.

N85-33873*# California Univ., Los Angeles.

ON THE IMPORTANCE OF VISCOUS DISSIPATION IN IO Abstract Only

M. N. Ross and G. Schubert *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 12 (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

A model of Io is presented that consists of an elastic inner core, a low strength asthenosphere, and a thin elastic outer shell. The middle layer is assumed to possess negligible shear strength and to be characterized by a Newtonian viscosity. The fluid in the viscous layer is forced to circulate mainly by the tidal distortion in the outer shell, modeled here as a variation in the distortion amplitude. As a result, heat is generated in the fluid by viscous dissipation. There are three important unconstrained parameters in the model: the fluid viscosity, the thickness of the fluid layer, and the degree to which the distortion of the outer shell is affected by the fluid viscosity. For a wide range of these model parameters viscous heating can generate just as much or even more heat than does elastic dissipation is the outer shell. The model suggests that much of Io's heat flow may be generated below the outer shell and could provide a source of energy for any silicate volcanism on the satellite. Author

N85-33874*# Westfaelische Wilhelms Univ., Muenster (West Germany). Geologisch-Palaeontologisches Inst.

MODELS OF PLANETARY STRUCTURE AND EVOLUTION: THE CASE OF IO Abstract Only

T. Spohn *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 13 (For primary document see N85-33849 22-91)

Avail: NTIS HC A03/MF A01 CSCL 03B

The interior structure of Jupiter's satellite Io is probably

layered with a liquid core surrounded by a rigid mantle, a partially molten asthenosphere and a thin rigid lithosphere. The core radius could roughly equal half the planetary radius if the core is mostly FeS and if the mantle's compressibility is close to that of Earth's upper mantle rocks. The lithosphere thickness is controlled by the balance of the heat flux q sub e across the lithosphere with the tidal heating rate H within the lithosphere and the heat flux q; from the interior into the lithosphere. The maximum thickness determined by a balance of q sub e with H is probably much smaller than the lithosphere thickness that maximizes H. Thus, if Io's interior was once melted and if it's resonant orbital state is ancient it will freeze from the inside out. The time scale of internal and latent heat removal in a molten Io is 10 to the eighth power. Io's strong volcanic activity suggests the persistence of a partially molten asthenosphere to the present time. Author

N85-33875*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAGNETOTAILS OF THE TERRESTRIAL PLANETS: A COMPARATIVE STUDY Abstract Only
J. A. Slavin, E. J. Smith, B. E. Goldstein, and S. P. Christon (California Inst. of Tech., Pasadena) *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 13 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Spacecraft observations have established that all of the terrestrial planets interact strongly with the solar wind and possess well developed magnetic tails. At Mercury, Earth, and possibly Mars the tail forms as a result of the solar wind dragging back field lines intrinsic to the planet. Venus differs dramatically from the other planets in that its magnetotail is composed of interplanetary field lines draped about the ionopause. Accordingly, the observations made at the terrestrial planets provide an opportunity to compare not only induced (Venus) magnetic tail properties with those of intrinsic field tails, but also the variation among intrinsic field tails ion the limits of no ionosphere (Mercury), weak intrinsic magnetic field (Mars), and strong magnetic field and ionosphere (Earth). A comparative investigation is made of terrestrial planet magnetotail structure and dynamics. The results are discussed in terms of the physical properties of these planets and their interactions with the solar wind. Author

N85-33876*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
VENUS, EARTH AND MARS: PRESENT BOUNDS ON SIMILARITIES AND DIFFERENCES IN BULK COMPOSITION Abstract Only
K. A. Goettel *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 14 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The bulk compositions of the terrestrial planets are constrained in part by rigorous bounds derivable from geophysical data and from chemical data obtained in situ or by remote sensing. In large part, however, the bulk compositions are constrained only by the inferred plausibility of assumptions made about the processes responsible for producing planets. Present data are consistent with Venus, Earth and Mars all having solar ratios of the major, non-volatile elements. The mantle of Mars has a higher FeO content than the Earth's present upper mantle. The FeO content of the Venus mantle is poorly constrained. Abundances of minor elements are virtually unconstrained by geophysical data and only weakly constrained by existing chemical data. Inferences drawn from SNC meteorites suggest that Mars may be enriched in most volatiles relative to the Earth. Simple models in which volatiles are added in a single component probably do not accurately predict bulk volatile inventories of the planets. Author

N85-33877*# California Inst. of Tech., Pasadena. Seismological Lab.
MINERALOGY AND CHEMISTRY OF THE EARTH Abstract Only
Don. L. Anderson *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 14 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The Earth is the prototype if not typical terrestrial planet. Ideas about the origin, evolution, structure and chemistry of the planets can be tested most thoroughly on the Earth. Similarly, the study of the other planets has generated new ideas which may be applicable to the Earth. For example the concepts of magma oceans, large polar wander, global stress fields, buoyant lithosphere, deep cumulate reservoirs, multiple tectonic styles and crust generation may also apply to the Earth, present or past. It is no longer valid to think of the mantle as an essentially homogeneous undifferentiated shell of olivine with pockes of basalt providing melts to midocean ridges and oceanic islands. It appears to be a well differentiated, outgassed body with both radial and lateral chemical variations. The lower mantle is close to chondritic in its major element chemistry. The transition region is garnet and clinopyroxene rich and may be a major basalt reservoir. This would explain the thin crust paradox. Chemical stratification of the Earth probably occurred during accretion. Author

N85-33878*# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Science.
A SOLID-STATE FRAMEWORK FOR TERRESTRIAL UPPER MANTLES Abstract Only
L. Estey, B. Douglas, and H. Spetzler *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 15 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

A framework is proposed for understanding the upper mantle structure of the terrestrial planets which is based on solid state dislocation processes. It is proposed that the base of the lithosphere on any planet with a Mg-Fe silicate rich upper mantle is defined by the threshold temperatures of low energy dislocation glide systems in olivine and the pyroxenes. This threshold temperature is approximately 1100 to 1200 K and is directly tied to the mobility of olivine and pyroxene dislocations. Using this definition, all terrestrial planets of the Inner Solar System are expected to have mantle lithospheres. Second, the anomalous properties of the asthenosphere in the Earth are related to the rheological properties of an olivine rich differentiate approximately 220 km thick. All of these properties can be the result of the abundant low energy glide systems in olivine which are mobile at temperatures above approximately 1200 K. It is proposed that a true planetary asthenosphere must be both olivine rich and at temperatures above approximately 1200 K. This mode for the asthenosphere does not require partial melting and is therefore less sensitive to the constraints of volatile content in the upper mantle. The thickness of planetary lithospheres is estimated as is maximum thickness of the olivine rich differentiate on each planet. The cooling of the olivine rich layer on Mars (and hence disappearance of the asthenosphere) may coincide with the cessation of global tectonic activity approximately 1 Gyr ago. Author

N85-33879*# Australian National Univ., Canberra.
CRUSTAL DEVELOPMENT IN THE TERRESTRIAL PLANETS Abstract Only
S. R. Taylor *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 15 refs (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The development of planetary crusts may be divided into primary, resulting from melting during accretion, and secondary crusts developed by partial melting from planetary mantles. The Mercurian crust is probably primary with no compelling evidence of later basaltic extrusions. Reflectance spectral evidence for the existence Fe2(+) is equivocal. The Viking Lander XRF data on Mars indicate basaltic material at both sites 4,000 km apart. Surface aeolian processes would be expected to provide a homogeneous average of the crust, but no evidence of more siliceous material is present. This conclusion is weakly supported by the Russian gamma ray data. No evidence for granite appears from the Russian Venera XRF data which indicates MORB-type and alkali basalt

(4% K2O) surface compositions. The highlands of Ishtar Terra and Aphrodite probably owe their elevation to tectonic processes rather than compositional effects. Venus may thus resemble the early Archean Earth. The terrestrial granitic continental crust is a product of episodic multiple partial melting events, probably a consequence of the presence of surface water. Author

N85-33880*# National Geodetic Survey, Rockville, Md.
CONTRASTS IN EVOLUTION OF VENUS AND EARTH Abstract Only
W. M. Kaula *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 16 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The differences of the two planets in dynamical characteristics and inert gas abundances require major differences of formation. There probably was an impact into the Earth much greater than any into Venus. The resulting heat pulse would have caused more rapid and thorough outgassing of the Earth, lending to an ocean retaining water. Water is the key to the differences in evolution between the planets. A most important consequence was less effective recycling of lithosphere on Venus, leading to a thick global crust which suppressed plate tectonics. Stratification is more pronounced in Venus, but there must remain sufficient heat sources at depth for convective support of the high plateaus. Author

N85-33881*# Westfaelische Wilhelms Univ., Muenster (West Germany). Geologisch-Palaeontologisches Inst.
ADIABATIC THERMAL MODELS FOR PLANETARY BODIES Abstract Only
T. Spohn *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 16 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

In a number of recent experiments it was found that the logarithmic derivative with respect to volume of the adiabatic temperature increase with pressure P to be an approximately constant quantity n. It was found that n decreases slightly with temperature, to be virtually unaffected by increasing pressure and to take values between 4 and 8 for a wide variety of materials. It is shown that these findings can be substantiated from thermodynamic arguments, finite strain theory, atomic potential theory and experimental data on the thermal expansion coefficient and the bulk modulus B. It will be shown that n is independent of pressure if it is exactly equal to dB/dP + 1. For these materials d log gamma/d log v = -1, where gamma is the thermodynamic Gruneisenparameter. It will increase with P during an isothermal transformation if n > dB/dP + 1 and decrease of n < dB/dP + 1. For most materials n is close to dB/dP and the changes will be slight if pressures do not become too extreme. During an adiabatic transformation n is virtually constant. Adiabatic thermal models for planetary bodies were calculated and are presented.
Author

N85-33882*# California Univ., Los Angeles. Inst. of Geophysics.
PRIMORDIAL MAGMASPHERES AND THEIR LASTING CONSEQUENCES Abstract Only
Paul H. Warren *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 17 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The lunar magmasphere is a useful but potentially misleading analog for the earliest evolution of other planetary objects. A significant fraction of the lunar magmasphere became a crust rich in buoyant cumulus plagioclase. Another significant fraction became a series of ultramafic cumulates (the mare basalt sources) complementary to the anorthosite. These events predetermined all subsequent lunar evolution. Empirically, the Moon was big enough to produce a magmasphere. Beyond a depth limit of roughly 200 km, nearly independent of the size of the planet, the remainder of the magmasphere will probably at all times be a single convective, and therefore essentially non-differentiating layer. The fraction of the mantle contained in the outer 200 km is of course inversely related to planet size. Compared to the Moon the Earth's mantle comprises a volume of 40 x greater and a pressure range 30 x greater. Steeper dP/dZ, favoring garnets and pyroxenes, also works to dampen differentiation in larger planets. One long term consequence of the Earth's magmasphere was probably a depletion of H2O in much of the mantle. Because water is a flux for mantle convection, anhydrous parts of the mantle probably had anomalously thick lithospheres and hot asthenospheres.
Author

N85-33883*# Geological Survey, Flagstaff, Ariz.
GEOLOGIC PROCESSES ON VENUS: AN UPDATE Abstract Only
H. Masursky *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 17 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Studies of Venera 15 and 16 radar image and altimetry data and reevaluation of Pioneer Venus and earlier Venera data have greatly expanded the perception of the variety and complexity of geologic processes on Venus. PV data have discriminated four highland regions (each different in geomorphic appearance), a large upland rolling plains region, and smaller areas of lowland plains. Two highland volcanic centers were identified that may be presently active, as suggested by their geomorphologic appearance combined with positive gravity anomalies, lightning strike clusters, and a change in SO2 content in the upper atmosphere. Geochemical data obtained by the Venera landers have indicated that one upland area and nearby rolling plains are composed of volcanic rocks, probably basalts or syenites. New Venera radar images of the Ishtar Terra region show folded and/or faulted linear terrain and associated volcanic features that may have been deformed by both compressional and extensional forces. Lowland surfaces resemble the mare basaltic lava flows that fill basins on the Moon, Mars and Earth. Ubiquitous crater like forms may be of either volcanic or impact origin; the origin of similar lunar features was determined by the character of their ejecta deposits. Author

N85-33884*# Hawaii Univ., Honolulu. Inst. of Geophysics.
PLANNING FOR VRM: RADAR AND SONAR STUDIES OF VOLCANIC TERRAINS ON EARTH, VENUS AND MARS Abstract Only
Peter J. Mouginis-Mark, Lisa R. Gaddis, Pamela L. Blake, Patricia Fryer, and Charles Ferrall *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 18 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Venera 15 and 16 radar images of Venus, together with Earth based data from the Arecibo Observatory, indicate that volcanism has played an important role in the evolution of the Venusian landscape. At the end of this decade, NASA's Venus Radar Mapper (VRM) spacecraft will return near global information that will further constrain the planet's geologic history. Due to the diversity of volcano/tectonic features that have already been identified on Venus, and the intrinsic differences between radar images and conventional photography, additional expertise is being developed with which to interpret the VRM images of this unusual environment. Several attempts to better understand the physical characteristics of volcanic terrains are described here. Pioneer Venus radar altimeter measurements of topographic variability and surface roughness are compared with Goldstone radar measurements of volcanic terrains on Mars. Synthetic aperture radar images obtained by the SIR-B Space Shuttle experiment over Kilauea Volcano, Hawaii, are employed to investigate the differences in radar returns from pahoehoe, aa and sheet lava flows. Four polarization, multiple incidence angle, aircraft radar images of the Medicine Lake area of N. California are used to address the unusually high cross-polarization ratio of lobate flows around Beta Regio on Venus, as measured by the Arecibo radar. Author

N85-33885*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPRESSIONAL ENVIRONMENT IN THE LOCATION AND ORIENTATION OF PLANETARY DORSA AND TERRESTRIAL EARTHQUAKE FAULT STRUCTURES Abstract Only
Jouko Raitala *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 18 refs (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Lunar mare ridges are not pure compressional ridges but their locations and orientations are most likely controlled by shear zones as seen from their Riedel-shear-like arrangements. On the Moon the crustal shortening has mostly taken place within mare areas but some young terra ridges are also to be seen indicating some crustal shortening also outside mare areas. This shortening has, however, not reached the same intensity as in the case of lobate scarp overthrusts on Mercury. G.L.C.

N85-33886*# Texas A&M Univ., College Station.
PLANETARY REORIENTATION BY SURFACE LOADS Abstract Only
R. J. Willemann *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 19 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Non-hydrostatic concentrations of mass at the surface of the planet have been suggested as mechanisms of permanent reorientation for all of the terrestrial planets and for the Moon. In order for such a load to control planetary orientation, three conditions must be satisfied. The surface load must be non-hydrostatically supported; the surface load must be large compared to internal departures from a hydrostatic mass distribution; and the load must be large compared to hydrostatic departures of the planetary figure from a sphere. The third condition comes from the consideration that if the load is non-hydrostatically supported, then the same processes which support the load will also the hydrostatic figure. Author

N85-33887*# Newcastle-upon-Tyne Univ. (England).
THE NON-HYDROSTATIC FIGURES OF THE TERRESTRIAL PLANETS Abstract Only
S. K. Runcorn *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 19 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Solid state creep being exponentially dependent on temperature must dominate the mechanical behavior of the mantles of terrestrial planets beneath their lithospheres. General arguments suggest that the lithospheres of the Moon and Mars are about 200 km thick; the Earth, Venus and Mercury much less. Short wavelength gravity anomalies are explained by the finite strength of the lithosphere: the lunar mascons being an example. The good correlation of the Venus and Mars gravity anomalies with topography up to spherical harmonics of degrees 10-15 is in striking contrast to the lack of correlation between the long wavelength components of the geoid and the continent-ocean distribution or even the plates. Attempts have been made to explain the former correlations by isostatic models but the depths of compensation seem implausible. Low degree harmonics of the gravity fields of the terrestrial planets as is certainly the case in the Earth must arise from the density variations driving solid state convection. In the case of Venus the less dense differentiated materials of the highlands seems to be positioned over the singular points of the convection pattern. Thus the correlated gravity field does not arise from the highlands but from the density difference in the convecting interior. In the Earth lack of correlation seems to arise from the fact that the plates have moved relative to the convection pattern the last 100 M yr. Author

N85-33888*# California Inst. of Tech., Pasadena.
DYNAMIC COMPENSATION OF VENUS'S GEOID: A COMPARISON WITH EARTH Abstract Only
W. S. Kiefer, B. H. Hager, and M. A. Richards *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 20 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Unlike Earth, on Venus long wavelength geoid anomalies correlate well with topography. Venus's admittance curve between harmonic degrees 3 and 18 is inconsistent with Airy isostasy but is consistent with dynamic support from convection being the dominant mechanism of compensation on Venus. We model dynamic compensation on Venus using simple flow models which assume a spherically symmetric Newtonian mantle viscosity profile. Preliminary models parameterize the viscosity variation with depth as a 2 layer model with a boundary at 720 km depth. A model in which viscosity in the lower mantle is a factor of 10 lower than in the upper mantle can explain Venus's observed admittance curve for degrees 3 through 18. Dynamic models which include a chemical boundary between the upper and lower mantle do not successfully explain the observed admittance curve, indicating that Venus does not have a chemically layered mantle. Author

N85-33889*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.
ADMITTANCE FUNCTIONS FROM VENUS VERTICAL GRAVITY AND MODES OF TOPOGRAPHIC SUPPORT Abstract Only
David R. Williams and W. M. Kaula *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 20 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Two-dimensional Fourier admittance functions have been estimated for various regions of Venus, using as input the Pioneer Venus topography data and the Venus vertical gravity model of Sjogren. Model admittance functions are computed for various cases, such as lithospheric loading from above, and support from below, for comparison. These models are functions of depth of compensation, flexural rigidity, and crust and mantle densities. The long wavelength topography and gravity signals contain most of the spectral power in the Venus data, and the admittances at these wavelengths are compatible with deep compensation of surface topography. Author

N85-33890*# Andlauer (Gerard), Mundelsheim (France).
THE COORBITAL HYPOTHESIS Abstract Only
Gerard Andlauer *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 21 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Voyager I and II have revealed the existence of 1980S1 and 1980S3 in the same orbit that add to the discovery of the Lagrange satellite 1980S6 for Dione and 1980S13 - 1980S25 for Thetys as a replica to the Trojan planets in the Jupiter orbit. These bodies may issue from the rupture of a primitive gaseous ring through a disturbance. The Lagrange figures keep stable while the rest of the objects drift in near paths and interact at each transit so as to form a gradual binary. The Moon - Earth system may have a such origin. Author

N85-33891*# Academy of Sciences (USSR), Moscow. Inst. Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln.
THE MAGNETIC FIELD OF PLANETS Abstract Only
Sh. Sh. Dolginov *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 21 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The strength of the dipole fields H sub Oi of the various inspected planets are connected by simple scaling law, involving observable angular velocity omega, planetary radia R sub p velocity omega and amplitude alpha of planetary precession, and radia R sub c, densities RHO sub c, conductivities sigma sub c of their liquid cores according to the contemporary models of planetary inner structure. The Lunar paleofield of 1G, its decay to zero is also explained in the frame of precession-dynamo model, evolution of the Earth-Moon system and primeval satellites in its suggested by Runcorn. Author

N85-33892*# Academy of Sciences (USSR), Moscow. Inst. Zemnogo Magnetizma, Ionosfery i Rasprostraneniia Radiovoln.

WHAT WE HAVE LEARNED ABOUT THE MAGNETIC FIELD OF MARS Abstract Only
Sh. Sh. Dolginov *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 22 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Sufficient and unambiguous evidences of the intrinsic martian magnetic field are: (1) the independence of the field polarity in Maritan magnetic tail from interplanetary magnetic fields (IMF) polarity inversion, established with the help of Mars-5 data; and (2) the incongruity between the sign of the radial component of the field measured in Martian tail (Mars-2) and that of the draped model with IMF data measured simultaneously (Mars-3) on February 23-24, 1972. Mar's dipole magnetic moment is within the limits (1.5 to 2.2) x 10 to e 22 G cc. The dipole axis is deflected from that of rotation on the angle I < 15 deg. The North magnetic pole is located in the South Hemisphere. In the frame of the precession-dinamo model the magnetic fields of the planets Mars and Earth are similar. The Martian magnetic field is the real obstacle for the solar wind near the planet. Author

N85-33893*# Geological Survey, Flagstaff, Ariz.
MARS LANDING SITES Abstract Only
H. Masursky *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 22 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

An intensive effort has been underway for the past two years to study possible landing sites for a future Mars rover and returned-sample mission. The task has been to identify and study nine sites, each of which is near a variety of representative geologic units. The choice of sites is independent of future decisions as to whether the rovers will be manned or unmanned, except that unmanned rover traverses may be shorter and more restricted. North and south polar locations, the Grand canyon that exposes layered terrain, two stream channels, two volcanic centers, and two upland sites are under consideration. Author

N85-33894*# Newcastle-upon-Tyne Univ. (England).
MAGNETIC FIELD GENERATION IN THE CORES OF TERRESTRIAL BODIES Abstract Only
S. K. Runcorn *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 23 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

Efforts to find some scaling law for the dipole moments of planets seem illusory for, although dynamo theory is still in a rudimentary state, once the critical magnetic Reynolds Number is exceeded it appears that the field strength is determined by the energy source, it it is permissible to treat the core as a heat engine. For this reason the lunar magnetic field is of special significance as the paleomagnetic evidence strongly suggests that the surface field was about 1 G 3.9 by diminishing exponentially to about .02 G 3.2 by ago and completely disappearing some time later. Author

N85-33895*# California Univ., Los Angeles. Inst. of Geophysics.
GEOCHEMICAL CONFIRMATION OF THE LUNAR MAGMASPHERE HYPOTHESIS Abstract Only
Paul H. Warren *In* Lunar and Planetary Inst. Terrest. Planets: Comp. Planetology 1985 p 23 (For primary document see N85-33849 22-91)
Avail: NTIS HC A03/MF A01 CSCL 03B

The lunar magmasphere (or magma ocean) hypothesis was originally conceived to account for the enrichment of cumulus plagioclase (Al and Ca) in the main (highlands) portion of the crust. The great age of the highlands, and the complementary pattern of Eu anomalies between the highlands and the younger mare basalts, helped convince most specialists that the magmasphere hypothesis is correct. Doubts persist, however, particularly among physicists concerned about heat sources. It was shown in 1976 that a plot of Na/Ca vs. Mg/Fe for pristine highlands cumulates manifests a profound bimodality: One group, the Mg-rich rocks, plots along a normal igneous trend of inverse correlation between Na/Ca and Mg/Fe; the other group, the ferroan anorthosites (FAN), features low Na/Ca and low Mg/Fe. Only the FAN group can be plausibly linked to plag. flotation over the magmasphere. Author

N85-33896# California Univ., Livermore. Lawrence Livermore Lab.
PLANETARY FLUIDS He AND NH3 AT HIGH SHOCK PRESSURES AND TEMPERATURES
W. J. Nellis, H. B. Radousky, A. C. Mitchell, N. C. Holmes, M. Ross, and D. A. Young Apr. 1985 14 p Presented at the 16th Lunar and Planetary Sci. Conf., Houston, Tex., 11 Mar. 1985
(Contract W-7405-eng-48)
(DE85-011851; UCRL-92575; CONF-8503115-2) Avail: NTIS HC A02/MF A01

Liquid He at 4.3 K and 1 atm was shocked to 16 GPa (160 kbar) and 12,000 K and double-shocked to 56 GPa and 21,000 K. Liquid perturbation theory was used to determine an effective interatomic potential from which the equation of state of He can be obtained over a wide range of densities and temperatures in the envelopes of the outer plants. A new fast optical pyrometer and a cryogenic specimen holder for liquid NH3 were developed to measure shock temperatures of 4400 and 3600 K at pressures of 59 and 48 GPa. These conditions correspond to those in the ice layers in Uranus and Neptune. The shock temperature data are in reasonable agreement with an equation of state by Ree based on an intermolecular potential derived from NH3 Hugoniot data. DOE

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-33897*# Tufts Univ., Medford, Mass.
SIMULTANEOUS SOLAR MAXIMUM MISSION AND VERY LARGE ARRAY (VLA) OBSERVATIONS OF SOLAR ACTIVE REGIONS Semiannual Progress Report, 1 Feb. 1985 - 30 Jan. 1986
Kenneth R. Lang 23 Aug. 1985 20 p refs
(Grant NAG5-501)
(NASA-CR-176090; NAS 1.26:176090) Avail: NTIS HC A02/MF A01 CSCL 03B

Simultaneous observations of solar active regions with the Solar Maximum Mission (SMM) Satellite and the Very Large Array (VLA) have been obtained and analyzed. Combined results enhance the scientific return far beyond that expected from using either SMM or VLA alone. A total of two weeks of simultaneous SMM/VLA data were obtained. The multiple wavelength VLA observations were used to determine the temperature and magnetic structure at different heights within coronal loops. These data are compared with simultaneous SMM observations. Several papers on the subject are in progress. They include VLA observations of compact, transient sources in the transition region; simultaneous SMM/VLA observations of the coronal loops in one active region and the evolution of another one; and sampling of the coronal plasma using thermal cyclotron lines (magnetic field - VLA) and soft X ray spectral lines (electron density and electron temperaure-SMM). F.M.R.

N85-33898# Los Alamos National Lab., N. Mex.
STATISTICAL ANALYSES IN THE STUDY OF SOLAR WIND-MAGNETOSPHERE COUPLING
D. N. Baker 12 Feb. 1985 40 p Presented at the Chapman Conf. on Solar Wind-Magnetosphere Energy Coupling, Pasadena, Calif., 12 Feb. 1985
(DE85-009596; LA-UR-85-1073; CONF-850277-4) Avail: NTIS HC A03/MF A01

The essential techniques and underlying statistical bases for the use of correlative methods in solar wind magnetosphere

coupling studies are reviewed. Techniques of visual correlation and time lagged linear cross correlation analysis are emphasized, but methods of multiple regression, superposed epoch analysis, and linear prediction filtering are also described briefly. The long history of correlation analysis in the area of solar wind magnetosphere coupling is reviewed with the assessments organized according to data averaging time scales (minutes to years). It is concluded that these statistical methods can be very useful first steps, but that case studies and various advanced analysis methods should be employed to understand fully the average response of the magnetosphere to solar wind input. Long term averages (greater than or equal to 1 hour) can reveal gross relationships, but only when dealing with high resolution data (1 to 10 min) can one reach conclusions pertinent to magnetospheric response time scales and substorm onset mechanisms. DOE

N85-33899# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
LINEAR FILTERS AS A METHOD OF REAL-TIME PREDICTION OF GEOMAGNETIC ACTIVITY
R. L. McPherron, D. N. Baker, and L. F. Bargatze 1985 16 p Presented at Chapman Conf. on Solar Wind-Magnetosphere Energy Coupling, Pasadena, Calif., 12 Feb. 1985
(Contract W-7405-eng-36)
(DE85-010760; LA-UR-85-1305; MCP-JPL-Paper-12-26-37; CONF-850277-2) Avail: NTIS HC A02/MF A01

Important factors controlling geomagnetic activity include the solar wind velocity, the strength of the interplanetary magnetic field (IMF), and the field orientation. Because these quantities change so much in transit through the solar wind, real-time monitoring immediately upstream of the Earth provides the best input for any technique of real-time prediction. One such technique is linear prediction filtering which utilizes past histories of the input and output of a linear system to create a time-invariant filter characterizing the system. Problems of nonlinearity or temporal changes of the system can be handled by appropriate choice of input parameters and piecewise approximation in various ranges of the input. Prediction filters for all the standard magnetic indices were produced and tested. The filters show that the initial response of the magnetosphere to a southward turning of the IMF peaks in 20 minutes and then again in 55 minutes. A simple, real-time system utilizing these filters which could predict a substantial fraction of the variation in magnetic activity indices 20 to 50 minutes in advance is described. DOE

N85-33900# Arizona Univ., Tucson. Dept. of Physics.
SOLAR VARIABILITY OBSERVED THROUGH CHANGES IN SOLAR FIGURE AND MEAN DIAMETER
H. A. Hill 24 May 1985 18 p
(Contract DE-AC02-80ER-10753)
(DE85-012857; DOE/ER-10753/5) Avail: NTIS HC A02/MF A01

A program to monitor solar luminosity variations through diameter measurements has been operated since 1981. The solar diameter is currently measured at multiple angles from the equator. Measurements at these different angles have the advantage that, not only can the solar oblateness be accurately measured, but, also, systematic errors, introduced by atmospheric refraction, can be reduced to a minimum. The primary emphasis during the last year has been on data analysis and interpretation. An extension of theoretical work relevant to the relationship between the solar diameter and luminosity for long period oscillations has been extended to include 160 min period oscillations, and several tests have been completed. An absolute calibration system for the telescope field has been constructed and is being tested. A review of this work is presented. DOE

N85-33327# Joint Publications Research Service, Arlington, Va.
VARIATION IN RADIOWAVE PROPAGATION CONDITIONS IN CORONA DURING SOLAR ACTIVITY CYCLE Abstract Only
A. I. Yefimov, O. I. Yakovlev, V. K. Shtrykov, and V. I. Rogalskiy *In its* USSR Rept.: Electron. and Elec. Eng. (JPRS-UEE-84-015) 23 Nov. 1984 p 8-9 Transl. into ENGLISH from Radiotekhn. i Electron. (Moscow), v. 29, no. 7, Jul. 1984 p 1274-1279 (For primary document see N85-33314 22-33)
Avail: NTIS HC A05/MF A01

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

N85-33901*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NINETEENTH INTERNATIONAL COSMIC RAY CONFERENCE. CONFERENCE PROGRAM AND AUTHOR INDEX
Frank C. Jones, comp. Washington Aug. 1985 259 p Conf. held in La Jolla, Calif., 11-23 Aug. 1985
(NASA-CP-2376; NAS 1.55:2376) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The program for the contributed papers contained in Volumes 1 through 8 is presented along with an Author Index for all volumes combined. The conference program was organized according to three major divisions: (1) Origin and Galactic Phenomena (volumes 1, 2, and 3); (2) Solar and Heliospheric Phenomena (volumes 4 and 5); and (3) High Energy Phenomena (volumes 6, 7, and 8). M.G.

N85-33902*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NINETEENTH INTERNATIONAL COSMIC RAY CONFERENCE. OG SESSIONS, VOLUME 1
Frank C. Jones, comp. Washington Aug. 1985 409 p refs Conf. held in La Jolla, Calif, 11-23 Aug. 1985 8 Vol.
(NASA-CP-2376-Vol-1; NAS 1.55:2376-Vol-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Contributed papers addressing cosmic ray origin and galactic phenomena are compiled. The topic areas covered in this volume include gamma ray bursts, gamma rays from point sources, and diffuse gamma ray emission. For individual titles, see N85-33903 through N85-34005.

N85-33903*# California Univ., San Diego, La Jolla. Center for Astrophysics and Space Sciences.
HEAO-1 OBSERVATIONS OF GAMMA RAY BURSTS
Geoffrey J. Hueter and James L. Matteson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 1-4 refs (For primary document see N85-33902 22-93)
(Contracts NAS8-27974; NAS8-36081)
(OG-1.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A search of data from the High Energy X-Ray and Low Energy Gamma Ray Experiment on HEAO-1 uncovered 14 gamma ray bursts. Nine of these events are reported for the first time. Except for the faintest events, all of the bursts detected by this experiment have been measured above an MeV, thereby confirming the hard spectral character of gamma ray burst spectra reported by SMM. Results give a burst rate of at least 105 per year above 6 times 10 to the minus 7th power ergs, which is consistent with previous measurements of burst frequency. Author

N85-33904*# Los Alamos National Lab., N. Mex.
SOFT-SPECTRUM GAMMA-RAY BURSTS
J. G. Laros, E. E. Fenimore, M. M. Fikani, R. W. Klebesadel, and S. R. Kane (California Univ., Berkeley) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 5-6 refs (For primary document see N85-33902 22-93)
(Contract NAS5-25980)
(OG-1.1-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A typical gamma to ray burst (GRB), when observed over the approximately 30 keV to 1 MeV range, has a 1 to 10 s duration and a spectrum describable in terms of a several-hundred-keV exponential function. However, KONUS data indicate that some

GRBs may belong to a separate class of short (approximately 0.1 s), soft (kT < 50 keV) events. This result has been questioned because the KONUS experiments, with only 4 s spectral time resolution and a lack of information approximately 30 keV, are not particularly well suited for the detection and study of these bursts. The UC Berkeley/Los Alamos Solar X-Ray Spectrometer/GRB experiment on the International Cometry Explorer (ICE), with nearly continuous coverage of approximately one-sixth of the sky down to 5 keV at 0.5 s resolution, is better designed for such a task. Using ICE data, it was confirmed that soft-spectrum events do indeed exist, apparently with properties that set them apart from the general GRB population. Results from the ICE experiment are presented. Author

N85-33905*# Academy of Sciences (USSR), Leningrad. Physical-Technical Inst.
ANNIHILATION RADIATION IN COSMIC GAMMA-RAY BURSTS
R. L. Aptekar, S. V. Golenetskii, Yu. A. Guryan, V. N. Ilyinskii, and E. P. Mazets *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 7-10 refs (For primary document see N85-33902 22-93)
(OG-1.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The pair annihilation radiation in gamma-ray bursts is seen as broad lines with extended hard wings. This radiation is suggested to escape in a collimated beam from magnetic polar regions of neutron stars. Author

N85-33906*# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Physics.
ON THE EMISSION REGION OF GAMMA RAY BURSTS
Edison P. Liang *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 11-14 refs (For primary document see N85-33902 22-93)
(OG-1.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Within the last few years the rapid accumulation of gamma ray burst spectral data, especially those of KONUS and solar maximum mission, has made the confrontation between theories of the gamma ray emission mechanisms and observations much more urgent and challenging. At present the most viable mode seems to be some combination of inverse Comptonization and synchrotron emission. Here, an attempt is made to limit the acceptable parameter space of the emission region by taking into account the maximum set of observational constraints. These are then applied to two specific scenarios: surface emission versus magnetospheric emission. Some observable predictions based on these scenarios are considered. Author

N85-33907*# Lodz Univ. (Poland). Inst. of Physics.
UNTHERMALIZED PLASMA IN BURSTS SOURCES
W. Tkaczyk and S. Karakula *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 15-18 refs (For primary document see N85-33902 22-93)
(OG-1.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The pair e(+)-e(-) annihilation phenomena in hot plasma was studied in order to evaluate the photon energy spectrum. The spectra of the broadening 0.511 MeV annihilation line was calculated in the case of unthermalized plasma, i.e., T sub e(-) does not equal T sub e(+). The energy spectra from annihilation process for unthermalized positrons are characterized by the presence of flat part for energies greater than 0.511 MeV. The flattening in the spectrum of annihilation unthermalized plasma is a strong indication that the observed features of the hard tailed spectrum of the gamma bursts can be well described by annihilation of hot positrons and cold electrons. It is proposed that the mechanism for the production of unthermalized positrons is associated with the charge separation in Eddington limited accretion onto a neutron star. Author

N85-33908*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTICAL MONITORING OF GAMMA-RAY SOURCE FIELDS
N. Gehrels, T. Gehrels (Arizona Univ., Tucson), J. V. Scotti (Arizona Univ., Tucson), J. E. Frecer (Arizona Univ., Tucson), and R. S. McMillan (Arizona Univ., Tucson) *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 19-22 refs (For primary document see N85-33902 22-93)
(OG-1.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The three gamma-ray burst source fields GBS1028+46, GBS1205+24, and GBS2252-03 have been monitored for transient optical emission for a combined total of 52 hours. No optical events were seen. The limiting magnitude for the search was M sub V = 15.8 longer and M sub V = 17.0 for 6.0 s or longer. Author

N85-33909*# ISRO Satellite Centre, Peenya, Bangalore (India).
SEARCH FOR OPTICAL BURSTS FROM THE GAMMA RAY BURST SOURCE GBS 0526-66
S. Seetha, K. V. Sreenivasaiah, T. M. K. Marar, K. Kasturirangan, U. R. Rao, and J. C. Bhattacharyya (Indian Inst. of Astrophysics., Bangalore) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 23-26 refs (For primary document see N85-33902 22-93)
(OG-1.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Attempts were made to detect optical bursts from the gamma-ray burst source GBS 0526-66 during Dec. 31, 1984 to Jan. 2, 1985 and Feb. 23 to Feb. 24, 1985, using the one meter reflector of the Kavalur Observatory. Jan. 1, 1985 coincided with the zero phase of the predicted 164 day period of burst activity from the source (Rothschild and Lingenfelter, 1984). A new optical burst photon counting system with adjustable trigger threshold was used in parallel with a high speed photometer for the observations. The best time resolution was 1 ms and maximum count rate capability was 255,000 counts s(-1). Details of the instrumentation and observational results are presented. Author

N85-33910*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SEARCH FOR INFRARED COUNTERPARTS OF GAMMA-RAY BURSTERS
Bradley E. Schaefer and Thomas L. Cline *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 27-28 refs (For primary document see N85-33902 22-93)
(OG-1.1-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The result of two searches for infrared counterparts of Gamma-ray Bursters (GRB's) is reported. The first search was made using data from the Infrared Astronomy Satellite and covered 23 positions. The second search was made with the Kitt Peak 1.5 m telescope and covered 3 positions. In neither of these two searches was any infrared candidate detected. Author

N85-33911*# Academy of Sciences (USSR), Moscow. Inst. for Nuclear Research.
NEUTRINO-ANTINEUTRINO ANNIHILATION AROUND COLLAPSING STAR
V. S. Berezinsky and O. F. Prilutsky *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 29-32 refs (For primary document see N85-33902 22-93)
(OG-1.1-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Stellar collapse is accompanied by emission of E sub neutrino approximately 10 MeV neutrinos and antineutrinos with the energy output W sub neutrino approximately 10 to the 53rd power to 10 to the 54th power erg. Annihilation of these particles in the vicinity of collapsar is considered. The physical consequences are discussed. Author

N85-33912*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SECOND CATALOG OF GAMMA RAY BURSTS: 1978 - 1980 LOCALIZATIONS FROM THE INTERPLANETARY NETWORK
J.-L. Atteia, C. Barat, K. Hurley, M. Niel, G. Vedrenne, W. D. Evans, E. E. Fenimore, R. W. Klebesadel, J. G. Laros, T. L. Cline

et al *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 33-36 refs Prepared in cooperation with Centre d'Etude Spatiale des Rayonnements, Toulouse, LANL, N. Mex., and Academy of Sciences (USSR), Moscow (For primary document see N85-33902 22-93)
(Contract NAS5-22307; NASA Order A-47981-B)
(OG-1.2-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Eighty-two gamma ray bursts were detected between 1978 September 14 and 1980 February 13 by the experiments of the interplanetary network (Prognoz 7, Venera 11 and 12 SIGNE experiments, Pioneer Venus Orbiter, International Sun-Earth Explorer 3, Helios 2, and Vela). Sixty-five of these events have been localized to annuli or error boxes by the method of arrival time analysis. The distribution of sources is consistent with isotropy, and there is no statistically convincing evidence for the detection of more than one burst from any source position. The localizations are compared with those of two previous catalogs. Author

N85-33913*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GAMMA RAY BURST SIZE-FREQUENCY DISTRIBUTIONS: SPECTRAL SELECTION EFFECTS
James C. Higdon and Richard E. Lingenfelter (California Univ., San Diego, La Jolla) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 37-40 refs (For primary document see N85-33902 22-93)
(OG-1.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The effects of spectral variation on the detection of gamma ray bursts were investigated. Selection biases resulting from these effects can account for the reported deviation of the observed size-frequency distribution in peak energy flux from that expected for a simple uniform distribution of sources. Thus these observations as yet provide no clear evidence for structure in the burst source distribution. Because of selection biases, the intrinsic average temperature of the bursts is much harder (kT approximately MeV) than the observed average (approximately 200 KeV). Author

N85-33914*# Consiglio Nazionale delle Ricerche, Bologna (Italy).
THE EFFECT OF ANISOTROPIC EMISSION ON THE LOG N-LOG S CURVE OF GAMMA-RAY BURSTS
G. Pizzichini *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 41-43 refs (For primary document see N85-33902 22-93)
(OG-1.2-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Some models for Gamma-Ray Burst spectra result in anisotropic emission. Here the effects of anisotropy on the log N-log S curve are considered. Author

N85-33915*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LIMITS TO THE BURSTER REPETITION RATE AS DEDUCED FROM THE 2ND CATALOG OF THE INTERPLANETARY NETWORK
J.-L. Atteia, C. Barat, K. Hurley, M. Niel, G. Vedrenne, W. D. Evans, E. E. Fenimore, R. W. Klebesadel, J. G. Laros, T. L. Cline et al *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 44-46 refs Prepared in cooperation with Center d'Etude Spatiale des Rayonnements, Toulouse, LANL, N. Mex., and Academy of Sciences (USSR), Moscow (For primary document see N85-33902 22-93)
(OG-1.2-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The burster repetition rate is an important parameter in many gamma ray burst models. The localizations of the interplanetary network, which have a relatively small combined surface area, may be used to estimate the average repetition rate. The method consists of (1) estimating the number of random overlaps between error boxes expected in the catalog and comparing this number to that actually observed; (2) modeling the response of the detectors in the network, so that the probability of detecting a burst can be estimated; and (3) simulating the arrival of bursts at the network assuming that burster repetition is governed by a Poisson process. The application of this method for many different burster luminosity functions shows that (1) the lower limit to the burster repetition rate depends strongly upon the assumed luminosity function; (2) the best lower limit to the repetition period obtainable from the data of the network is about 100 months; and (3) that a luminosity function for all bursters similar to that of the 1979 Mar 5 burster is inconsistent with the data. Author

N85-33916*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN INTERNALLY CONSISTENT GAMMA RAY BURST TIME HISTORY PHENOMENOLOGY
T. L. Cline *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 47-50 refs (For primary document see N85-33902 22-93)
(OG-1.2-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A phenomenology for gamma ray burst time histories is outlined. Order of their generally chaotic appearance is attempted, based on the speculation that any one burst event can be represented above 150 keV as a superposition of similarly shaped increases of varying intensity. The increases can generally overlap, however, confusing the picture, but a given event must at least exhibit its own limiting characteristic rise and decay times if the measurements are made with instruments having adequate temporal resolution. Most catalogued observations may be of doubtful or marginal utility to test this hypothesis, but some time histories from Helios-2, Pioneer Venus Orbiter and other instruments having one-to several-millisecond capabilities appear to provide consistency. Also, recent studies of temporally resolved Solar Maximum Mission burst energy spectra are entirely compatible with this picture. The phenomenology suggested here, if correct, may assist as an analytic tool for modelling of burst processes and possibly in the definition of burst source populations. Author

N85-33917*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GAMMA-RAY BURST VARIABILITY ABOVE 4 MeV
R. A. Schwartz, J. C. Ling, W. A. Mahoney, William A. Wheaton, and A. S. Jacobson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 51-54 refs (For primary document see N85-33902 22-93)
(OG-1.2-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The relationship between the hard X-ray and gamma ray emissions during four bursts using the anti-coincidence shields of the High Energy Astronomy Observatory 3 (HEAO 3) Gamma Ray Spectrometer is explored. Recent observations of gamma ray bursts by the Solar Maximum Mission Gamma Ray Spectrometer (GRS) have shown that high energy emission above 1 MeV is a common and energetically important feature (Matz et al. 1985). Time histories of four gamma ray bursts in 3 energy bands (> keV, around 511 keV, and > 4 MeV) with 10.24 a resolution show that the > 4 MeV flux is only weakly coupled to the spectrum below approximately 600 keV. Author

N85-33918*# Tokyo Univ. (Japan). Institute of Space and Astronautical Science.
RELATIONSHIPS BETWEEN LOG N-LOG S AND CELESTIAL DISTRIBUTION OF GAMMA-RAY BURSTS
Jun Nishimura and Takamasa Yamagami *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 55-58 refs (For primary document see N85-33902 22-93)
(OG-1.2-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The apparent conflict between log N-log S curve and isotropic celestial distribution of the gamma ray bursts is discussed. A possible selection effect due to the time profile of each burst is examined. It is shown that the contradiction is due to this selection effect of the gamma ray bursts. Author

N85-33919*# Tata Inst. of Fundamental Research, Bombay (India).
SEARCH FOR GAMMA RAYS OF ENERGY < 10(15) eV FROM

CYGNUS X-3

P. N. Bhat, M. R. Rajeev, P. V. RamanaMurthy, M. V. S. Rao, S. Sinha, B. V. Sreekantan, S. C. Tonwar, and P. R. Vishwanath *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 59-61 refs (For primary document see N85-33902 22-93)

(OG-2.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Finite flux of excess radiation of energy > 10 to the 15th power has been reported by two groups from the direction of Cygnus X-3, with the characteristic periodicity of 4.8 hrs. Samorski and Stamm find that the muon content of the showers generated by this excess radiation is about 77% of that in normal cosmic ray showers, whereas the expectation for gamma ray showers is less than 10%. It is thus difficult to understand the nature of the radiation arriving from the direction of Cygnus X-3. Samorski and Stamm measured the muon densities close to the core (approx. 10 m), where contamination due to other components is severe. Even though this does not explain the high ratio of muon densities, measurements should be carried out away from the core to establish the nature of the radiation. In order to establish the signal from Cygnus X-3 and its muon content with better statistical significance, an extensive air shower array, specifically designed for this purpose was operated at Kolar Gold Fields (longitude: 78 deg .3 E; latitude: + 12 deg .95; atmospheric depth: 920 q/square centimeters) since September, 1984. The details of the array and the accuracy of arrival direction measurements are discussed. Author

N85-33920*# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy).

OBSERVATION OF AN EXCESS OF COSMIC RAY MUONS OF ENERGIES < 2 TeV FROM THE DIRECTION OF CYGNUS X-3

G. Battistoni, E. Bellotti, C. Bloise, G. Bologna, P. Campana, C. Castagnoli, A. Castellina, V. Chiarella, A. Ciocio, and D. Cundy *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 62-65 refs Prepared in cooperation with Milan Univ., CNR, Turin, and CERN, Geneva (For primary document see N85-33902 22-93)

(OG-2.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A high flux of muons from the Cygnus X-3 direction has been observed in NUSEX experiment at depths greater than 4600 hg/sq cm s.r. The excess muons show the 4.8 hour modulation in arrival time typical of this source. A study of this modulation was done in order to find the best value of the period and of the period derivative. The muon flux underground from NUSEX and SOUDAN (1800 hg/sq cm) experiments are used to determine the energy spectrum at sea level. The shape and the absolute intensities are found similar to those attributed to gamma rays responsible for production of air showers detected in direction of Cygnus X-3 in the energy range 10 to the 12th power to 10 to the 15th power eV. Author

N85-33921*# Nottingham Univ. (England).

MUON CONTENT OF GAMMA RAY INDUCED EAS FROM CYGNUS X-3 Abstract Only

P. R. Blake, W. F. Nash, M. R. Saich, and G. B. Stanley *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 66 (For primary document see N85-33902 22-93)

(OG-2.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

During 1984 the Leeds group (Lambert et al, OG 2,1-6) have observed emission above 5 times 10 to the 14th power eV in July, September and October at phi approximately 0.6. These observations were made with an array which included the Nottingham 10 sq m muon detector. A search for muons in events at the phase peak and off source has yielded the following results: (1) for 42 on source events we find an average muon density of 0.63 muons m(-2) at a mean core distance Bar R = 32 m and mean primary energy approximately 25 times 10 to the 15th power eV; (2) for 21 off source events average muon density = 1.6 m(-2), Bar R = 32 m with mean primary energy approximately 2.0 x 10 to the 15th power eV; (3) for 11 of the 42 on source events, zero muons were recorded in the 10 sq ms. For these events Bar R = 41 m and mean primary energy approximately 1.5 x 10 to the 15th power eV; (4) for 8 of the 21 off source events, zero muons were recorded in the 10 sq ms. For these events Bar R = 37 m and mean primary energy approximately 1.5 times 10 to the 15th power eV. For all the events the mean zenith angle was approximately 16 deg. A more detailed comparison of on source and further off source events will be presented. Author

N85-33922*# Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research.

GAMMA RAYS OF ENERGY < OR = 10(15) eV FROM CYG X-3

T. Kifune, K. Nishijima (Kobe Univ.), T. Hara, Y. Hatano, N. Hayashida, M. Honda, K. Kamata, Y. Matsubara (Kyoto Univ.), M. Mori (Kyoto Univ.), and M. Nagano *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 67-70 refs (For primary document see N85-33902 22-93)

(OG-2.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The experimental data of extensive air showers observed at Akeno have been analyzed to detect the gamma ray signal from Cyg X-3. After muon poor air showers are selected, the correlation of data acquisition time with 4.8 hours X-ray period is studied, giving the data concentration near the phase 0.6, the time of X-ray maximum. The probability that uniform backgrounds create the distribution is 0.2%. The time averaged integral gamma ray flux is estimated as (1.1 + or - 0.4)x 10 to the -14th power cm(-2) sec(-1) for Eo > 10 to the 15th power eV and (8.8 + or - 5.0)x 10 to the 14th power cm(-2) sec(-1) for Eo > 6 x 10 to the 14th power eV. Author

N85-33923*# Leeds Univ. (England). Dept. of Physics.

OBSERVATIONS OF CYGNUS X-3 ABOVE 10(15) eV FROM 1979 - 1984

A. Lambert, J. Lloyd-Evans, J. C. Perrett, R. J. O. Reid, A. A. Watson, and A. A. West *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 71-74 refs (For primary document see N85-33902 22-93)

(OG-2.1-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The ultra high energy gamma-ray source, cygnus X-3, has been observed more or less continuously with an array sensitive to > 10 to the 15th power ev primaries between 1 Jan. 1979 and 31 Dec. 1984. There is evidence for time variability in the phase of gamma-ray emission over this period. Author

N85-33924*# Academy of Sciences (USSR), Moscow. Inst. for Nuclear Research.

ON GAMMA AND NEUTRINO RADIATION FROM CYG X-3

V. S. Berezinsky *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 75-78 refs (For primary document see N85-33902 22-93)

(OG-2.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The production of high energy gamma and neutrino radiation is studied for Cyg X-3. A heating model is proposed to explain the presence of only one gamma-pulse during 4.8 h period of the source. The acceleration mechanisms are discussed. High energy neutrino flux from Cyg X-3 is calculated. Author

N85-33925*# Durham Univ. (England). Dept. of Physics.

1000 GeV GAMMA RAYS FROM CYGNUS X-3: AN UPDATE

P. M. Chadwick, J. C. Dowthwaite, I. W. Kirkman, T. J. L. McComb, K. J. Orford, and K. E. Turver *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 79-82 refs (For primary document see N85-33902 22-93)

(OG-2.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Measurements of 1000 GeV gamma-rays from Cygnus X-3 made with the University of Durham facility at Dugway, Utah in 1981/82 are reviewed. The light curve of the 4.8 hour modulated

emission is updated and shows evidence significant at the 4.4 sigma level for strong emission (9% of the cosmic ray rate) at phase 0.625 and less significant (1.4 sigma level) indications of weaker emission (3% of the cosmic ray rate) at phase 0.125. The effect constituting the excess on the few nights showing the strongest emission appears to arise from the smallest Cerenkov light signals suggesting a steep gamma-ray spectrum. The 1982 data have been searched unsuccessfully for evidence of emission at phase 0.2, in coincidence with the results from the ultra-high energy (extensive Air Showers (EAS) measurements in 1979-1982. A systematic investigation of a long term variation in the strength of the peak of the 4.8 hr modulated 1000 GeV gamma-ray emission has been made. We find that in addition to the approximately 34 d variation reported by us previously, a stronger effect exists at around 19d. Author

N85-33926*# Bhabha Atomic Research Centre, Kashmir (India). Nuclear Research Lab.

EVIDENCE FOR LONG-TERM VARIABILITY IN THE ULTRA HIGH ENERGY PHOTON FLUX FROM CYGNUS X-3

C. L. Bhat, R. C. Rannot, H. S. Rawat, H. Razdan, V. K. Sanecha, and M. L. Sapru *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 83-86 refs (For primary document see N85-33902 22-93)

(OG-2.1-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A time-correlation analysis of atmospheric Cerenkov pulses by a wide-angle photomultiplier system was previously shown to have present in it a nonrandom component which seemed associated with the Right Ascension (RA) range approx. 20+or-04h. A recent examination of multi-muon events recorded by a photon-decay detector shows a similar time-dependent effect, closely matching the previous results, supporting the suggestion that the effect is of cosmic origin. However, even though Cyg. X-3 lies well inside the region of peak intensity, it does not seem possible to ascribe to it the whole effect, for the implied photon flux appears too large to be reconciled to various gamma-ray measurements of Cyg. X-3. The original data were subjected to a phase-histogram analysis and it as found that only 2.5% of overall recorded data are compatible with a phase-dependent emission from Cyg. X-3. Assuming these events to be gamma rays yields a detected flux of (2.6 + or - 0.3) x 10 to the minus 12th power gamma cm -2s-1 above 5 x 10 to the 14th power eV. Comparing this value with more recent ultra high energy (UHE) photon data from the same source, it is suggested that the available data generally favor a long-term reduction in the Cyg. X-3 inferred luminosity (> 10 to the 13th power eV) by a factor of (1.8 + or - 0.3) per year. Author

N85-33927*# University Coll., Dublin (Ireland).

VARIABILITY IN THE HIGH ENERGY GAMMA RAY EMISSION FROM CYG X-3 OVER A TWO-YEAR PERIOD (1983 - 1984) AT E < 4 X 10(11) eV

M. F. Cawley, D. J. Fegan, K. Gibbs (Harvard-Smithsonian Center for Astrophysics), P. W. Gorham (Hawaii Univ.), R. C. Lamb (Iowa State Univ.), D. F. Liebing (Iowa State Univ.), N. A. Porter, V. J. Stenger (Hawaii Univ.), T. C. Weekes (Harvard-Smithsonian Center for Astrophysics), and R. J. Williams *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 87-90 refs (For primary document see N85-33902 22-93)

(OG-2.1-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Cygnus X-3 is observed to emit gamma rays with energies in excess of 4 x 10 to the 11th power eV during two out of 9 observational categories over an 18 month time span. The emissions are observed at the 0.6 phase of the characteristic 4.8 hr light curve for this binary system. We estimate a peak flux at phase 0.6 of 5 x 10 to the minus 10th power photons cm-2s-1 at a software threshold of 8 x 10 to the 11th power eV for Oct/Nov 1983. A flux for the June 84 effect cannot be reliably calculated at present due to lack of Monte Carlo simulations for the energy range and spectral region. For the other 7 observational categories the observations are consistent with zero source emission. The light curve would appear to be variable on a time scale of a couple of weeks at these categories. Selection of compact images in accordance with Monte Carlo simulations combined with empirical optimization techniques have led to an enriched gamma ray light curve for the Oct/Nov 1983 data. Selection on the basis of shower orientation, however, has not led to any notable enhancement of the gamma ray content. Individual Cherenko images can be reliably sorted on an event by event basis into either proton-induced or photon-induced showers. Author

N85-33928*# Academy of Sciences (USSR), Moscow. Inst. for Nuclear Research.

A SEARCH FOR GAMMA-RAY POINT SOURCES WITH THE CARPET SHOWER ARRAY

V. V. Alexeenko, A. E. Chudakov, N. S. Khaerdinov, A. S. Lidvansky, G. Navarra (Turin Univ.), S. S. Ozrokov, V. V. Sklyarov, and V. A. Tizengauzen *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 91-94 refs (For primary document see N85-33902 22-93)

(OG-2.1-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A search for super-high energy gamma-ray point sources has been carried out. The well known source Cyg X-3 was observed first and preliminary results of data analysis are presented. There is not positive excess of showers from the source region, but phase analysis discovers a small pulse at phase 0.6 which corresponds to the integral flux (6 + or - 3) X 10 to the minus 14th power cm-2 sec-1 at E sub gamma > 3x10 to the 14th power eV. Author

N85-33929*# Leiden Univ. (Netherlands).

CYG X-3: NOT SEEN IN HIGH-ENERGY GAMMA RAYS BY COS-B

W. Hermsen, K. Bennett (ESA. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands), G. F. Bignami (Consiglio Nazionale delle Ricerche, Milan), J. B. G. M. Bloemen (Sterrewache, Leiden, Netherlands), R. Buccheri (Consiglio Nazionale delle Ricerche, Palermo, Italy), P. A. Caraveo (Consiglio Nazionale delle Ricerche, Milan), H. A. Mayer-Hasselwander (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany), M. E. Oezel (Max-Planck-Inst. fuer Radioastronomie, Bonn), A. M. T. Pollock (Birmingham Univ.), and A. W. Strong (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 95-98 refs (For primary document see N85-33902 22-93)

(OG-2.2-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

COS-B had Cyg X-3 within its field of view during 7 observation periods between 1975 and 1982 for in total approximately 300 days. In the skymaps (70 meV < E < 5000 meV) of the Cyg-X region produced for each of these observations and in the summed map, a broad complex structure is visible in the region 72 deg approximately less than 1 approximately less than 85 deg, approximately less than 5 deg. No resolved source structure is visible at the position of Cyg X-3, but a weak signal from Cyg X-3 could be hidden in the structured gamma-ray background. Therefore, the data has been searched for a 4.8 h timing signature, as well as for a source signal in the sky map in addition to the diffuse background structure as estimated from tracers of atomic and molecular gas. Author

N85-33930*# Delaware Univ., Newark. Dept. of Physics.

CONSTRAINTS ON COSMIC-RAY OBSERVATION OF CYGNUS X-3

M. V. Barnhill, III, T. K. Gaisser (Franklin Inst., Newark, Del.), Todor Stanev (Franklin Inst., Newark, Del.), and Francis Halzen (Wisconsin Univ., Madison) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 99-102 refs (For primary document see N85-33902 22-93)

(OG-2.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Two experimental groups working at different minimum energies have reported underground muons coming from the direction of Cygnus X-3 with rates that vary in synchrony with its binary period.

At the Mont Blanc detector the events are, within statistics, uniformly spread over a 5 degree circle around the position of Cygnus X-3, even though the angular resolution is significantly better than this. The ratio of events in the phase peak to total muons observed rises as a function of minimum muon energy. An experiment also sees an excess in the number of pairs of codirectional multiple muon events arriving within about 5000 seconds of each other, the excess events coming from a direction about 20 degrees away from Cygnus X-3. Author

N85-33931*# Boston Univ., Mass. Dept. of Astronomy.
ULTRA HIGH ENERGY GAMMA RAYS, COSMIC RAYS AND NEUTRINOS FROM ACCRETING DEGENERATE STARS
Kenneth Brecher and Ganesar Chanmugam (Louisiana State Univ., Baton Rouge) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 103-106 refs (For primary document see N85-33902 22-93)
(OG-2.2-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Super-Eddington accretion for a recently proposed unipolar induction model of cosmic ray acceleration in accreting binary star systems containing magnetic white dwarfs or neutron stars is considered. For sufficiently high accretion rates and low magnetic fields, the model can account for: (1) acceleration of cosmic ray nuclei up to energies of 10 to the 19th power eV; (2) production of more or less normal solar cosmic ray composition; (3) the bulk of cosmic rays observed with energies above 1 TeV, and probably even down to somewhat lower energies as well; and (4) possibly the observed antiproton cosmic ray flux. It can also account for the high ultra high energy (UHE) gamma ray flux observed from several accreting binary systems (including Cygnus X-3), while allowing the possibility of an even higher neutrino flux from these sources, with L sub nu/L sub gamma is approximately 100. Author

N85-33932*# Durham Univ. (England). Dept. of Physics.
RELEVANCE OF THE OBSERVATION OF UHE GAMMAS TO HARD X-RAY ASTRONOMY
N. C. Rana (Tata Inst. of Fundamental Research, Bombay), A. W. Wolfendale, M. Sadzinska (Inst. of Nuclear Studies, Lodz, Poland), and J. Wdowczyk (Inst. of Nuclear Studies, Lodz, Poland) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 107-110 refs (For primary document see N85-33902 22-93)
(OG-2.2-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A number of consequences of the presence of sources of ultra high energy (UHE) gamma rays, exemplified by Cygnus X-3, are examined. It is shown that there should be a flux of hard X-rays at all Galactic latitudes; a significant flux of extragalactic hard X-rays may also result. Relevance to theories of cosmic ray particle origin and propagation is discussed. Author

N85-33933*# Utah Univ., Salt Lake City. Dept. of Physics.
500 TeV GAMMA RAYS FROM HERCULES X-1
R. M. Baltrusaitis, G. L. Cassiday, R. Copper, J. W. Elbert, P. R. Gerhardy, E. C. Loh, Y. Mizumoto, P. Sokolsky, P. Sommers, and D. Steck *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 111-114 refs (For primary document see N85-33902 22-93)
(Grants NSF PHY-82-01089; NSF PHY-84-25294)
(OG-2.2-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A signal (chance probability = .0002) with the 1.24 s period of Hercules X-1 has been observed using the Utah Fly's Eye. The signal's relatively long period and high shower energy conflict with some popular models of particle acceleration by pulsars. Optical and X-ray data suggest a picture in which energetic particles produce multi-TeV gamma rays by collisions with Hercules X-1's accretion disk. Author

N85-33934*# Maryland Univ., College Park.
A MODEL FOR THE UHE GAMMA-RAYS FROM HERCULES X-1
David Eichler and W. Thomas Vestrand (New Hampshire Univ., Durham) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 115-118 refs (For primary document see N85-33902 22-93)
(Grant NSF AST-83-17755)
(OG-2.2-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

An outburst of gamma rays with energies E gamma > 10 to the 12th power eV was recently detected from the X-ray pulsar Hercules X-1. The outburst had a 3 minute duration and occurred at a time during the 35 day X-ray modulation that is associated with X-ray turnon. The gamma rays also have the same 1.24 second modulation that is observed at X-ray energies. Subsequently a 40 minute outburst was detected at E gamma > 10 to the 14th power eV. The interaction of ultrahigh energy particles with a precessing accretion disk explain the observed gamma ray light curve. The constraints one can place on acceleration mechanisms and the possibility that the UHE particles are accelerated by shocks in an accretion flow are explained. Author

N85-33935*# University Coll., Dublin (Ireland). Dept. of Physics.
HERCULES X-1: PULSED GAMMA-RAYS DETECTED ABOVE 150 GeV
M. F. Cawley, D. J. Fegan, K. G. Gibbs (Harvard-Smithsonian Center for Astrophysics), P. W. Gorham (Hawaii Univ., Honolulu), S. Kenny, R. C. Lamb (Iowa State Univ., Ames), D. F. Liebing (Iowa State Univ., Ames), N. A. Porter, V. J. Stenger (Hawaii Univ., Honolulu), and T. C. Weekes (Harvard-Smithsonian Center for Astrophysics) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 119-122 refs (For primary document see N85-33902 22-93)
(Contracts DE-AC02-82ER-40063; DE-AC02-80ER-10774; DE-AC03-83ER-40103)
(OG-2.2-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The 1.24 second binary pulsar Her X-1, first observed in X-rays in 1971 by UHURU has now been seen as a sporadic gamma ray source from 1 TeV up to at least 500 TeV. In addition, reprocessed optical and infrared pulses are seen from the companion star HZ Herculis. Thus measurements of the Her X-1/HZ Herculis system span 15 decades in energy, rivaling both the Crab pulsar and Cygnus X-3 in this respect for a discrete galactic source. Author

N85-33936*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH-RESOLUTION SPECTROSCOPIC OBSERVATION OF VELA X-1 IN THE HARD X-RAY ENERGY RANGE
J. Tueller, T. L. Cline, B. J. Teegarden, Ph. Durouchoux (CEA, Saclay, France), and N. Prantzos *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 123-126 refs (For primary document see N85-33902 22-93)
(OG-2.2-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The first high resolution (1.2 keV FWHM hard X-ray equal to or greater than 20 keV) observation of Vela X-1 is reported. Data were accumulated during a 5 hour balloon flight launched on December 5, 1984. A summed epoch analysis yields a light curve and period (283 sec) consistent with previous measurements. Significant pulsations were present to an energy of 60 keV. No statistically significant features were observed in the energy spectrum and the spectrum is well fit (x sup 2 = 17.8 for 16 d.o.f.) by a simple exponential spectrum with an E folding length of 10.8 + or - 1.0 keV. Author

N85-33937*# Consiglio Nazionale delle Ricerche, Turin (Italy). Ist. di Cosmogeofisica.
EXPERIMENTAL RESULTS ON GAMMA-RAY SOURCES AT E SUB 0 = 10(13) - 10(14) eV
C. Morello, G. Navarra (Turin Univ.), L. Periale, and P. Vallania *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 127-130 refs (For primary document see N85-33902 22-93)
(OG-2.2-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The detection of very high energy gamma ray sources has been reported in the last few years by means of extensive air shower observations. The Plateau Rosa array for the registration of the arrival directions of extensive air showers has been operating since 1980 and first results on Cygnus X-3 have been reported. Here, the status of observations of Cygnus X-3 and of the Crab Pulsar are reported. R.J.F.

N85-33938*# University Coll., Dublin (Ireland).
OBSERVATIONS OF THE CRAB NEBULA AT ENERGIES < 4.10(11)
M. F. Cawley, D. J. Regan, K. Gibbs (Harvard-Smithsonian Center for Astrophysics), P. W. Gorham (Hawaii Univ.), R.C. Lamb (Iowa State Univ.), D. F. Liebing (Iowa State Univ.), P. K. MacKeown (Hong Kong Univ.), N. A. Porter, V. J. Stenger (Hawaii Univ.), and T. C. Weekes (Harvard-Smithsonian Center for Astrophysics) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 131-134 refs Sponsored in part by DOE, Smithsonian Scholarly Studies Fund, and National Board of Science and Technology of Ireland (For primary document see N85-33902 22-93)
(OG-2.3-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Since the development of gamma-ray astronomical telescopes, the Crab Nebula has been a prime target for observations. From 100 to 1000 MeV, the pulsar PSR0531 is the dominant source with a light-curve similar to that seen at lower energies; there is also some evidence for longterm amplitude variations but none for emission from the Nebula itself. In the very high energy gamma-ray region there have been reported detections of pulsed emission with longterm time variations from minutes to months. Recently a pulsed flux has been reported that resisted over a long time interval. The detection of a flux from the Nebula at the 3 sigma level at energies of 3x1011eV was reported; there was no evidence of periodic emissions on any time scale during the three years of observations. A new measurement of very high energy gamma rays from the Crab Nebula is reported using the imaging system on the Whipple Observatory 10m reflector. B.W.

N85-33939*# Bulgarian Academy of Science, Sofia.
SEARCH FOR EXCESS SHOWERS FROM CRAB NEBULA
I. N. Kirov, J. N. Stamenov, S. Z. Ushev, V. D. Janminchev (High Pedagogical School), V. S. Aseikin (P. N. Lebedev Physical Inst.), S. I. Nikolsky (P. N. Lebedev Physical Inst.), N. M. Nikolskaja (P. N. Lebedev Physical Inst.), V. I. Yakovlev (P. N. Lebedev Physical Inst.), and A. E. Morozov (P. N. Lebedev Physical Inst.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 135-138 refs (For primary document see N85-33902 22-93)
(OG-2.3-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The arrival directions of muon poor showers registrated in the Tien Shan experiment during an effective running time about I,8.IO(4)h were analyzed. It is shown that there is a significant excess of these showers coming the direction of Crab Nebula. E.A.K.

N85-33940*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VERY HIGH ENERGY GAMMA RAYS FROM THE CRAB NEBULA
O. T. Tuemer (California Univ., Riverside), W. A. Wheaton, C. P. Godfrey (Missouri Western State Coll.), and R. C. Lamb (Iowa State Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 139-142 refs Sponsored in part by DOE, and California Inst. of Tech. (For primary document see N85-33902 22-93)
(OG-2.3-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Observations of the Crab pulsar using the atmospheric Cerenkov technique were conducted for 22 hours. The light curve obtained shows a single peak at approximately the position of the expected main peak with a significance level of 3.2 sigma. The pulsed flux above 200 GeV is 2.5 + or - 0.8 x 10 to the 11th power cm(-2)s(-1). Author

N85-33941*# Tata Inst. of Fundamental Research, Bombay (India).
MICROBURST OF TeV GAMMA RAYS FROM THE CRAB PULSAR
P. R. Vishwanath, P. N. Bhat, S. K. Gupta, P. V. RamanaMurthy, and B. V. Sreekantan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 143 ref (For primary document see N85-33902 22-93)
(OG-2.3-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data on Crab pulsar from atmospheric Cerenkov array at Ooty have shown emission of TeV gamma rays in the form of microbursts. These are a series of events which are unusually closely spaced in time with time separations of less than 1.5 milliseconds. The phasogram of events in the bursts when analyzed with the Crab pulsar period shows significant peaks. Data further show that the signal is at the same absolute phase as the radio peak. Monte Carlo calculations show that the probability of peaks being due to chance is very small. Author

N85-33942*# Tata Inst. of Fundamental Research, Bombay (India).
SECONDARY PERIODICITIES OF MICROBURSTS OF TeV GAMMA RAYS FROM THE CRAB PULSAR
P. R. Vishwanath, P. N. Bhat, S. K. Gupta, and P. V. RamanaMurthy *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 144 refs (For primary document see N85-33902 22-93)
(OG-2.3-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Observations were made during the past several years on the Crab pulsar using the Ooty atmospheric Cerenkov array with the aim of detecting possible emission of ultra high energy gamma rays by the pulsar. During the course of these observations, it was found that the Crab pulsar emits TeV gamma rays in bursts of short duration. The microbursts of TeV gamma rays from the Crab pulsar, which were seen in the data of at least three years, also reveal interesting secondary periodicities. It was noticed at first that some bursts could be connected with the others that occurred during the same night or during the next two nights with integral number of cycles of periods 43 + or - 1 minute. Ten possible periods in the vicinity of 43 minutes were determined for all the combinations of bursts for each year. The best values of periods thus obtained were different from year to year. But when, instead of the real time, the number of Crab cycles elapsed between the bursts was used as the unit of time, two values of burst periods - 77460 and 77770 Crab cycles - were found to be significant in the data of at least two years. A Monte Carlo simulation using 1500 trial periods chosen randomly within + or - 5 minutes of the original burst period did not reveal any value of the period as significant. M.G.

N85-33943*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Physics.
DETECTION OF GAMMA-RAY LINES FROM THE DIRECTION OF THE CRAB NEBULA
A. Owens, R. M. Myers (Durham Univ., England), and M. G. Thompson (Durham Univ., England) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 145-148 refs (For primary document see N85-33902 22-93)
Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Crab Nebula and its associated pulsar NP0531+21 were observed during a balloon flight of the Durham MK1 high resolution spectrometer on June 6, 1981. The data indicate two significant line features of energies of 404.7 and 1049.8 keV with intensities of (7.2 + or - 2.1) x 0.001 and (12.0 + or - 0.5) x 0.01/5. After subtracting instrumental resolution, the widths of these lines were determined to be (3.5 + or - 1.4) keV and (6.3 + or - 1.6) keV at 404.7 and 1049.8 keV respectively. A third line at 78.8 keV was detected as a transient event with a peak intensity of (1.1 + or - 0.3) x 0.01 photons sq cm/s and a width < 1.5 keV. It is shown that all three line features are consistent with a point source located at the Crab. E.A.K.

N85-33944*# Academia Sinica, Beijing (China). High Energy Astrophysics Group.
OBSERVATION OF HARD X-RAYS FROM THE CRAB PULSAR AND A0535+26
Mei Wu, Changjian Dai, Zhuguo Lu, Yuqian Ma, Guanhua Li, Zhenzi Fan, Chengmu Zhang, Chunxian Xu, Xiyuan Zhang, and Yidong Gu *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 149-150 (For primary document see N85-33902 22-93)
(OG-2.3-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Crab pulsar PSR0531+21 was observed in a balloon flight from the Xianghe Balloon Station (China). Data were obtained in the range 20 to 200 keV with a poswish hard X-ray telescope which comprised a 150 sq cm primary crystal of 5 mm thick CsI(T1) which actively shielded the lower 2 pi steradians by a 5 cm thick NaI(T1) crystal. The scintillation pulses originating in CsI and NaI crystals are distinguished by pulse shape discrimination. The telescope has a field of view of approximately 4 deg H psi H pi determined by graded shield and collimator. The effective geometric area of the detector is 116 sq cm. It is noted that when folding a data flow on a long period interference from the data acquisition, transmission and recording system considerably affect the result. E.A.K.

N85-33945*# California Univ., Riverside. Dept. of Physics.
GAMMA RAYS OF 0.3 TO 30 MeV FROM PSR 0531+21
R. Stephen White, William Sweeney, Tuemay Tuemer, and Allen D. Zych *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 151-154 refs (For primary document see N85-33902 22-93)
(Grant NGR-05-008-022)
(OG-2.3-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Pulsed gamma rays from the Crab Pulsar PSR 0531+21 are reported for energies of 0.3 to 30 MeV. The observations were carried out with the UCR gamma ray double Compton scatter telescope launched on a balloon from Palestine, Texas at 4.5 GV, at 2200 LT, September 29, 1978. Two 8 hr observations of the pulsar were made, the first starting at 0700 UT (0200 LT) September 30 just after reaching float altitude of 4.5 g/sq cm. Analysis of the total gamma ray flux from the Crab Nebula plus pulsar using telescope vertical cell pairs was published previously. The results presented supersede the preliminary ones. The double scatter mode of the UCR telescope measures the energy of each incident gamma ray from 1 to 30 MeV and its incident angle to a ring on the sky. The time of arrival is measured to 0.05 ms. The direction of the source is obtained from overlapping rings on the sky. The count rate of the first scatter above a threshold of 0.3 MeV is recorded every 5.12 ms. The Crab Pulsar parameters were determined from six topocentric arrival times of optical pulses. E.A.K.

N85-33946*# Durham Univ. (England). Dept. of Physics.
THE 1000 GeV GAMMA RAY EMISSION FROM RADIO PULSARS
P. M. Chadwick, J. C. Dowthwaite, I. W. Kirkman, T. J. L. McComb, K. J. Orford, and K. E. Turver *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 155-158 refs Sponsored in part by United Kingdom Science and Engineering Research Council (For primary document see N85-33902 22-93)
Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Radio pulsars have concentrated on long observations of the Crab pulsar and showed that it emits short intense bursts and a persistent weak periodic flux at gamma-ray energies > 1000 GeV. It was shown that the light curve of the persistent emission was dominated by a single peak, coincident with the position of the radio and low energy gamma-ray main pulse. The results of a more detailed analysis of the structure of this main pulse are reported following an appraisal of the timing system. It is shown that at energies > 1000 GeV the duration of the main pulse is not greater than 0.4 ms, which is less than that seen at all frequencies other than radio. Flux limits for the emission of 1000 GeV gamma-rays by seven other radio pulsars are reported E.A.K.

N85-33947*# Tata Inst. of Fundamental Research, Bombay (India).
PULSED EMISSION OF TeV GAMMA RAYS FROM VELA PULSAR
P. N. Bhat, S. K. Gupta, P. V. RamanaMurthy, B. V. Sreekantan, and P. R. Vishwanath *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 159-160 (For primary document see N85-33902 22-93)
Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Ooty atmospheric Cerenkov array, consisting of 10 parabolic mirrors of 0.9 m diameter and 8 of 1.5 m diameter, was used for observations on the Vela pulsar to see if it emits gamma rays in the TeV energy range. During the winter of 1984-85, the array was split into two parts: (1) consisting wholly of the smaller mirrors, and (2) wholly of the bigger mirrors. The two arrays were operated at two different sites to distinguish a marginally significant genuine pulsar signal from spurious signals produced trivially by chance fluctuations in the background rates. All the mirrors were pointed at the celestial object to track it for durations of the order of 1 to 6 hours during clear moonless nights. The event time data is analyzed to detect a possible pulsed emission of TeV gamma rays using the contemporaneous pulsar elements on the basis of their radio observations on the Vela pulsar. Results from the analyses of observations made during the winters of 1982-83 and 1984-85 on steady pulsed emission and on possible transient emission is presented. E.A.K.

N85-33948*# Durham Univ. (England). Dept. of Physics.
THE 1000 GeV GAMMA RAYS FROM ms PULSARS
P. M. Chadwick, J. C. Dowthwaite, I. W. Kirkman, T. J. L. McComb, K. J. Orford, and K. E. Turver *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 161-164 refs Sponsored in part by United Kingdom Science and Engineering Research Council Prepared in cooperation with Dugway Proving Ground, Utah (For primary document see N85-33902 22-93)
(OG-2.3-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The detection of 1000 GeV gamma-rays with the characteristic 6.1 ms periodicity of the radio pulsar PSR 1953 +29 is reported. This result, significant at the 5.4 beta level, provides the first direct evidence for the association of the 6 ms radio pulsar PSR1953+29 with the gamma-ray source 2CG065+0. Extensive observations of the 1.5 ms pulsar PSR 1937 are also reported. E.A.K.

N85-33949*# Bhabha Atomic Research Centre, Bombay (India).
PERIODIC GAMMA-RAY EMISSIONS FROM GEMINGA AT < OR = 10(12) eV
R. K. Kaul, H. S. Rawat, V. K. Sanecha, R. C. Rannot, M. I. Sapru, A. K. Tickoo, R. A. Qazi, C. L. Bhat, H. Razdan, and S. C. Tonwar (Tata Inst. of Fundamental Research) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 165-168 refs (For primary document see N85-33902 22-93)
(OG-2.4-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Analysis of data from an atmospheric Cerenkov telescope indicated the periodic emission of gamma rays of energy > 10 to the 12th power eV, at 60.25 second period, from 2CG 195+4. The gamma ray flux at 99% confidence level is estimated to be 9.5 x 10 to 12 photons/sq cm/s. E.A.K.

N85-33950*# Consiglio Nazionale delle Ricerche, Palermo (Italy). Ist. di Fisica Cosmica e Informatica.
SEARCH FOR PERIODICITIES NEAR 59 s IN THE COS-B GAMMA-RAY DATA OF 2CG195+04 (GEMINGA)
R. Buccheri, A. M. T. Pollock (Birmingham Univ.), K. Bennett (ESA, Noordwijk), G. F. Bignami (Consiglio Nazionale delle Ricerche, Milano), P. A. Caraveo (Consiglio Nazionale delle Ricerche, Milano),

W. Hermsen (Leiden Univ.), H. A. Mayer-Hasselwander (Max-Planck-Inst. for Physik und Astrophysik, Garching, West Germany), and B. Sacco *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 169-172 refs (For primary document see N85-33902 22-93)
(OG-2.4-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The COS-B data relating to five observations in the general direction of Geminga, spanning 6.7 years, were searched for pulsation near 59 s. The SAS-2 indication is not confirmed. An indication of a 59 s pulsation in the gamma ray emission from 2CG195+04 (Geminga) was reported. Early analysis of COS-B data supported the result while later improved statistics did not confirm it. Subsequently, detection of a 59 s pulsation in the emission from the direction of Geminga at ultra high gamma and X-rays was reported. Geminga was identified with the X-ray source 1E0630+128. The final COS-B data on Geminga which was observed five times for a total of 214 days are reported. Author

N85-33951*# University Coll., Dublin (Ireland). Dept. of Physics.
SEARCH FOR GAMMA-RAYS ABOVE 400 GeV FROM GEMINGA
M. F. Cawley, D. J. Fegan, K. Gibbs (Harvard-Smithsonian Center for Astrophysics), P. W. Gorham (Hawaii Univ., Honolulu), R. C. Lamb (Iowa State Univ., Ames), D. F. Liebing (Iowa State Univ., Ames), P. K. MacKeown (Hong Kong Univ.), N. A. Porter, V. J. Stenger (Hawaii Univ., Honolulu), and T. C. Weekes (Harvard-Smithsonian Center for Astrophysics) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 173-176 refs Sponsored by DOE, Smithsonian Scholarly Studies Fund, and National Board of Science and Technology of Ireland (For primary document see N85-33902 22-93)
(OG-2.4-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Observations of Geminga made at the Whipple Observatory using the atmospheric Cherenkov technique during the moonless periods of November 1983 to February 1984 and November 1984 till February 1985 were examined for evidence for the emission of gamma rays with energy in excess of approx 400 GeV. Evidence of either a steady flux or a flux pulsed with a period near 60 seconds were studied. In neither case was any significant effect observed, enabling the establishment 3 of sigma upper limits of 5.5 x 10 to the -11th power photons/sq cm/s and 2.0 x 10 to the -11th power photons/sq cm/s for the steady and pulsed emission respectively. The limit to the pulsed flux is approximately a factor of six below that predicted. E.A.K.

N85-33952*# Crimean Astrophysical Observatory (USSR).
ON THE 1983 OBSERVATIONS OF THE GAMMA-RAY SOURCE 2CG195+4
Yu. L. Zyskin and D. B. Mukanov (Academy of Sciences (USSR), Moscow) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 177-180 refs (For primary document see N85-33902 22-93)
(OG-2.4-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The source 2CG 195+4 (Geminga) was observed at E = gamma > 2 x 10 to the 7th power eV in December, 1983 with the Tien Shan high altitude facility. The mean gamma flux was equal to (7.0 + or - 4.5) x 10 to the -11th power quanta/sq cm sec. Probably the gamma ray flux is varying with the time with a period 59.49 s. Author

N85-33953*# Tata Inst. of Fundamental Research, Bombay (India).
OBSERVATIONS ON TeV GAMMA RAYS FROM GEMINGA AND PSR 0950+08
P. N. Bhat, S. K. Gupta, P. V. RamanaMurthy, S. Swaminathan, and P. R. Vishwanath *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 181-182 refs (For primary document see N85-33902 22-93)
(OG-2.4-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Geminga (2 CG 195+04) which exhibits a periodicity with a period of 59 to 60 s in its emission of X-rays, GeV gamma rays and TeV gamma rays was studied. During the winter of 1984 to 1985, this object was observed to see if it emits TeV gamma rays with a periodicity approx 60 s. The observations were carried out at two different sites separated by 11 Km with the Ooty Atmospheric Cerenkov Array split into two parts. Data were collected during clear moonless nights for a total duration of 15.3 hours spread over 2 months. Since the first time derivative of period is believed to be large and uncertain. The total data are subdivided into segments of duration not more than 3 days each to steer clear of the effects of P in the phase analysis. If TeV gamma ray signals are seen in each of these segments, it is possible to derive P from observed data. E.A.K.

N85-33954*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HEAO 3 UPPER LIMITS TO THE EXPECTED 1634 KeV LINE FROM SS 483
William A. Wheaton, J. C. Ling, W. A. Mahoney, and A. S. Jacobson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 183-186 refs (For primary document see N85-33902 22-93)
(OG-2.4-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A model based on 24 Mg(1369) was developed as the source of the lines in which refractory grains in the jets, containing Mg and 0, are bombarded, by ambient protons in the local ISM. The narrowness of the features results because the recoil Mg nucleus is stopped in the grain before the 1369 keV excited state decays. A consequence of the 24 Mg interpretation is the expected appearance of other emission lines, due to 20 Ne and 20 Na, which are produced by proton bombardment of 24 Mg at the 33 MeV/nucleon energy corresponding to the velocity of the jets. These lines appear at rest energies of 1634 keV and 1636 keV, respectively, and should have essentially the same total flux as that emited at 1369 keV. The HEAO 3 data are examined to search for the 1634 keV (rest) emission. The observation and analysis, the results, and the implications for the understanding of SS 433 are discussed. E.A.K.

N85-33955*# Sachs/Freeman Associates, Inc., Bowie, Md.
SEARCH FOR GAMMA RAY LINES FROM SS433
B. J. Geldzahler, G. H. Share (NRL, Washington, D.C.), R. L. Kinzer (NRL, Washington, D.C.), D. J. Forrest (New Hampshire Univ., Durham), E. L. Chupp (New Hampshire Univ., Durham), and E. Rieger (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 187-190 refs (For primary document see N85-33902 22-93)
(Contract NAS5-28609; NASA Order S-14513-D)
(OG-2.4-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data obtained with the Gamma Ray Spectrometer (0.3 to 9 MeV) aboard the Solar Maximum Mission satellite from 1980 to 1985 for evidence of the reported Doppler shifted lines from SS433 were examined. The data base covers a total of 468 days when SS433 was in the field of view and includes times of quiescent and flaring radio activity. In 9 day integrations of the SMM data no evidence is found for gamma ray line emission from SS433. The 99% confidence upper limits for 9 day integrations of the shifted 1.37 and 6.1 MeV lines are 0.0013 gamma/sq cm-s and 0.0007 gamma/sq cm-s, respectively. The 360 day time averaged upper limits are < 0.0002 gamma/sq cm-s x 0.0001 gamma/sq cm-s for both lines. E.A.K.

N85-33956*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HIGH-RESOLUTION SPECTRUM OF CYGNUS X-1
J. C. Ling, W. A. Mahoney, William A. Wheaton, and A. S. Jacobson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 191-192 refs (For primary document see N85-33902 22-93)
(OG-2.4-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A high resolution spectrum of Cygnus X-1 in the 45 to 600 keV range is presented. The measurement was made by the HEAO 3 gamma ray spectrometer during 82 days in the fall of 1979 and spring of 1980, when the source was in its normal low state. Results of a search for narrow emission lines from the source are reported. The spectrum shows no significant narrow features. The 3 delta upper limit to a narrow 511 keV annihilation line is 3 x 0.0001 photons/sq cm/s. There is also no evidence in HEAO 3 broadband data above 500 keV for the broad annihilation feature observed by HEAO 1. E.A.K.

N85-33957*# Centre d'Etude Spatiale des Rayonnements, Toulouse (France).
LOW-ENERGY GAMMA RAYS FROM CYGNUS X-1
J. P. Roques, P. Mandrou, F. Lebrun (CEA, Saclay, France), and J. Paul (CEA, Saclay, France) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 193-196 refs (For primary document see N85-33902 22-93)
(OG-2.4-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Cyg X-1 was observed by the balloonborne telescope OPALE, in June 1976. The high energy spectrum of the source, which was in its superlow state, was seen to extend well beyond 1 MeV. The observed low energy gamma ray component of Cyg X-1 is compared with the predictions of recent models involving accretion onto a stellar black hole, and including a possible contribution from the pair annihilation 511 keV gamma ray line. E.A.K.

N85-33958*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
EXCESS GAMMA-RAYS IN THE DIRECTION OF THE RHO OPHIUCHI CLOUD: AN EXOTIC OBJECT?
Thierry Montmerle, Philippe Andre, and Eric D. Feigelson (Pennsylvania State Univ., University Park) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 197-200 refs (For primary document see N85-33902 22-93)
(OG-2.5-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The COS-B X-ray data in the direction of the rho Oph dark cloud show an extended structure; at the same time, the region of highest intensity has a spatial distribution compatible with a localized source; 2CG353+16 which is designated Oph gamma. The possibility of an excess gamma ray flux over what is expected on the basis of the interaction of average density cosmic rays with an estimated cloud mass of 2 to 4 000 M is still open, pending an extended CO survey matching the gamma ray data. Estimates for this excess factor are in the range 2 to 4. While the cloud mass may be underestimated, it should be noted that an excess of the same order appears to be present in the nearby Oph-Sag area, well surveyed in CO with the Columbia dish. Possible reasons for a gamma ray excess, in view of two recent observational developments: an Einstein X-ray survey and a VLA radio survey, both covering the approx 2 deg diameter Oph gamma error box. Current interpretations link the gamma ray excess to the cloud gas, in which some active agent is present: stellar winds, or interaction with the North Polar Spur. E.A.K.

N85-33959*# Tata Inst. of Fundamental Research, Bombay (India).
SPECTRAL EVOLUTION OF GAMMA-RAYS FROM ADIABATICALLY EXPANDING SOURCES IN DENSE CLOUDS
S. A. Stephens *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 201-204 refs (For primary document see N85-33902 22-93)
(OG-2.5-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The excess of antiprotons (P) observed in cosmic ray was attributed to their production in supernova (SN) envelopes expanding in dense clouds. While creating P, gamma rays are also produced and these clouds would shine as gamma-ray sources. The evolution of the gamma-ray spectrum is calculated for clouds of r sub H = 10.000 and 100.000/cu cm. E.A.K.

N85-33960*# Tata Inst. of Fundamental Research, Bombay (India).
SUPERNOVA EXPLOSION IN DENSE CLOUDS IN THE GALAXY AND THE COS-B GAMMA-RAY SOURCES
S. A. Stephens *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 205-208 refs (For primary document see N85-33902 22-93)
(OG-2.5-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Supernova (SN) exploding in dense cloudlets produce large fluxes of gamma-rays. They would shine on gamma-ray sources, but their life time is small. Flux distribution of these sources in the Galaxy are calculated and compared with the COS-B catalogue of sources. E.A.K.

N85-33961*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
GALACTIC GAMMA-RAY SOURCES, SNOBS, AND GIANT H2 REGIONS
Thierry Montmerle *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 209-212 refs (For primary document see N85-33902 22-93)
(OG-2.5-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Progress towards understanding the nature of the COS-B galactic gamma-ray sources was made by two recent developments. The developments are: (1) the existence of extensive wide-latitude CO surveys, from the Northern Hemisphere, and from the Southern Hemisphere which give more precise information on molecular cloud population of the Perseus, Sagittarius, and Carina spiral arms; (2) the study of the time variability of gamma-ray sources in gamma-rays but also at other wavelengths, leading to the discovery of four new variable sources in addition to the already known Crab and Vela pulsars. Three classes of gamma-ray sources are found; invariable sources, active sources, and passive sources. E.A.K.

N85-33962*# Sandia Labs., Albuquerque, N. Mex.
SEARCH FOR POSITRON ANNIHILATION LINE AND CONTINUUM RADIATION FROM THE GALACTIC CENTER
C. J. MacCallum and M. Leventhal (Bell Telephone Labs., Murray Hill, N.J.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 213-216 refs (For primary document see N85-33902 22-93)
(OG-2.5-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Our balloon-borne germain gamma-ray telescope was flown over Alice Springs, Australia, on 1984 November 20 to search for the 511 keV positron annihilation line from the Galactic Center. The measured line flux at Earth was (0.6 + or - 4.4) x 0.001 ph/sq cm/s indicating that the source was still in a low or off state. E.A.K.

N85-33963*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SPECTRA AND POSITIONS OF GALACTIC GAMMA-RAY SOURCES
F. K. Knight, J. L. Matteson (California Univ., San Diego, La Jolla), G. V. Jung (California Univ., San Diego, La Jolla), and R. E. Rothschild (California Univ., San Diego, La Jolla) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 217-220 refs Sponsored in part by ONR (For primary document see N85-33902 22-93)
(Grant NAG8-499)
(OG-2.5-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The UCSD/MIT Hard X-Ray and Low Energy Gamma-Ray Experiment aboard HEAO-1 scanned the galactic center region during three epochs in 1977 and 1978 from 13 to 180 keV. The results are presented from the scanning epoch of 1978 September. Twenty-two known 2 to 10 keV source positions were necessary for an acceptable fit to the data. The spectra of the 16 strongest, least confused sources are all consistent with power laws with photon spectral indices ranging from 2.1 to 7.2. Acceptable fits to thermal bremsstrahlung models are also possible for most sources. No one source in this survey can be extrapolated to higher energy

to match the intensity of the gamma-ray continuum as measured by HEAO-1 large field of view detectors, which implies that the continuum is a composite of contributions from a number of sources. Author

N85-33964*# Consiglio Nazionale delle Ricerche, Milan (Italy). Ist. Fisica Cosmica.
A SEARCH IN THE COS-B DATA BASE FOR CORRELATED TIME VARIABILITY IN REGIONS CONTAINING OBJECTS OF INTEREST
P. A. Caraveo, R. Buccheri (Consiglio Nazionale delle Ricerche, Palmero, Italy), J. Clear (ESA. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands), O. Foa (Milan Univ.), and A. M. T. Pollock (Birmingham Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 221-224 refs (For primary document see N85-33902 22-93)
(OG-2.5-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

As is well known, association of the gamma-ray sources with celestial objects is, in general, difficult on a pure positional basis, while correlated time variability could obviously provide such proof. This technique can be employed on regions of the gamma-ray sky containing interesting objects of known variability at some wavelength even in the absence of a recognized gamma-ray excess with the aim to extract a weak but predictable signal from the surrounding noise. This technique is applied here on a longer variability time scale, generally of the order of days. Photons coming from the sky regions centered on the various celestial objects considered were selected with energies > 100 MeV and with arrival directions within an energy-dependent area of radius of approx 6 deg at 100 MeV. In order to construct a time profile of such photons, their arrival times were grouped in bins of dimensions defined by the available photons number and by the value of the period searched for. B.W.

N85-33965*# Max-Planck-Inst. fuer Radioastronomie, Bonn (West Germany).
RADIO OBSERVATIONS OF FOUR ANTICENTER 2CG GAMMA-RAY SOURCES
M. E. Oezel, R. Schlickeiser, and W. Sieber *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 225-228 refs (For primary document see N85-33902 22-93)
(OG-2.5-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The 2CG sources 218-00, 135+01, 121+04 and 95+04 have been observed at two radio frequencies and the flux values and spectra of the radio sources observed within the gamma-ray fields are catalogued down to a sensitivity of approx 30 mJy at lambda 11 cm. Possible gamma-ray counterpart candidate objects are briefly discussed. Author

N85-33966*# Tata Inst. of Fundamental Research, Bombay (India).
BALLOON OBSERVATIONS OF HARD X-RAYS FROM SOME GALACTIC X-RAY SOURCES Abstract Only
S. V. Damle, P. K. Kunte, S. Naranan, B. V. Sreekanlan, D. A. Leahy (Calgary Univ., Alberta), and D. Venkatesan (Calgary Univ., Alberta) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 229 (For primary document see N85-33902 22-93)
(OG-2.5-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

An X-ray telescope consisting of 400 cm phoswich detectors (NaI(T1)/CsI(Na)) was flown from Hyderabad (India) on 18 December 1984. The field of view was 5 deg x 5 deg FWHM. In a 10 hour float at 4 MB several galactic X-ray sources were tracked by the telescope using an on-board microprocessor. Fluxes and spectra in 18-120 keV X-rays for SCO X-1, GX 1+4, Gx 5-1, GX 17+2, SCT X-1, CYC X-1 an CYG X-3 will be presented. Author

N85-33967*# Hong Kong Univ. Dept. of Physics.
FURTHER STUDIES OF X-RAY STRUCTURE OF THE PERSEUS CLUSTER
M. M. Lau and E. C. M. Young *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 230-233 refs (For primary document see N85-33902 22-93)
(OG-2.5-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The X-ray sources in the Perseus cluster have been studied by many authors. Available data on the spatial and spectral distributions are examined and summarized. Based on these observations, a consistent model is proposed for the production of X-rays and gamma-rays in the region around NGC 1275. It is shown that good agreement with observations is obtained by assuming the emission of soft X-rays for thermal bremsstrahlung and of hard X-rays and gamma-rays from the inverse Compton process. B.W.

N85-33968*# Utah Univ., Salt Lake City. Dept. of Physics.
ALL SKY NORTHERN HEMISPHERE 10(15) EV GAMMA-RAY SURVEY
R. M. Baltrusaitis, G. L. Cassiday, R. Cooper, J. W. Elbert, P. R. Gerhardy, E. C. Loh, Y. Mizumoto, P. Sokolsky, P. Sommers, D. Steck et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 234-237 refs (For primary document see N85-33902 22-93)
(Grant NSF PHY-82-01089)
(OG-2.6-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Flux limits in the range 10 to the minus 13th power-10 to the minus 12 power/sq cm/s have been obtained by observing Cerenkov flashes from small air showers. During 1983, a 3.5 sigma excess of showers was observed during the phase interval 0.2 to 0.3 of the 4.8h period of Cygnus X-3, but no excess was found in 1984 observations. Author

N85-33969*# Lodz Univ. (Poland). Cosmic Ray Lab.
SEARCH FOR ULTRA HIGH ENERGY GAMMA-RAYS FROM VARIOUS SOURCES
T. Dzikowski, J. Gawin, B. Grochalska, J. Korejwo, and J. Wdowczyk *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 238-241 refs (For primary document see N85-33902 22-93)
(OG-2.6-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The hypothesis that there exists an excess of showers from the Galactic plane on the level 1 to 2% at energies just above 10 to the 16th power eV is explored. The excess shower from the Galactic plane seems to be very similar in properties to excess showers from the point sources/flat spectrum, deficit of low energy muons. Those facts suggest that the excess from the Galactic plane are probably due to summing up of the contribution from individual point sources. That in turn suggest that those sources are rather numerous. B.W.

N85-33970*# Tata Inst. of Fundamental Research, Bombay (India).
A SEARCH FOR SOURCES OF ULTRA HIGH ENERGY GAMMA RAYS AT AIR SHOWER ENERGIES WITH OOTY EAS ARRAY
S. C. Tonwar, N. V. Gopalakrishnan, and B. V. Sreekantan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 242-244 refs (For primary document see N85-33902 22-93)
(OG-2.6-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A 24 detector extensive air shower array is being operated at Ootacamund (2200 m altitude, 11.4 deg N latitude) in southern India to search for sources of Cosmic gamma rays of energies greater then 5 x 10 to the 13th power eV. The angular resolution of the array has been experimentally estimated to be better than about 2 deg. Since June '84, nearly 2.5 million showers have been collected and their arrival directions determined. These showers are being studied to search for very high energy gamma ray emission from interesting astrophysical objects such as Cygnus X-3, Crab pulsar and Geminga. Author

N85-33971*# Leeds Univ. (England). Dept. of Physics.
OBSERVATIONS OF POTENTIAL ULTRA HIGH ENERGY GAMMA-RAY SOURCES ABOVE 10(15) eV
A. Lambert, J. Lloyd-Evans, J. C. Perrett, A. A. Watson, and A. A. West *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 245-246 refs (For primary document see N85-33902 22-93)
(OG-2.6-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Haverah Park 50 m water-Cerenkov array has been used to examine a number of periodic sources for ultra high energy gamma-ray emission above 10 to the 15th power eV. The data, recorded between 1 Jan. 1979 and 31 Dec. 1984, feature a modest angular resolution of approx 3 deg with millisecond arrival time resolution post 1982. The sources investigated include the Crab pulsar, Her X-1, Au0115 + 63 and Geminga. All objects have been detected by workers in the TeV region, with varying degrees of confidence. B.W.

N85-33972*# Adelaide Univ. (Australia). Dept. of Physics.
OBSERVATION OF GAMMA-RAYS FROM LMC X-4 ABOVE 10(16) eV
R. J. Protheroe and R. W. Clay *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 247-250 refs Sponsored in part by Australian research grants scheme (For primary document see N85-33902 22-93)
(OG-2.6-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data from the University of Adelaide air shower array at Buckland Park taken over a three year period have been analyzed to search for evidence of ultra high energy gamma-ray emission from neutron star binary X-ray sources having known orbital periods. The detection of UHE gamma-rays from LMC X-4 above 10 to the 16th power eV, is reported; the first extragalactic object to be positively detected at these energies. Author

N85-33973*# Durham Univ. (England). Dept. of Physics.
THE 4U 0115+63: ANOTHER ENERGETIC GAMMA RAY BINARY PULSAR
P. M. Chadwick, N. A. Dipper, J. C. Dowthwaite, I. W. Kirkman, T. J. L. McComb, K. J. Orford, and K. E. Turver *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 251-254 refs Sponsored in part by Science and Engineering Research Council (For primary document see N85-33902 22-93)
(OG-2.6-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Following the discovery of Her X-1 as a source of pulsed 1000 Gev X-rays, a search for emission from an X-ray binary containing a pulsar with similar values of period, period derivative and luminosity was successful. The sporadic X-ray binary 4U 0115-63 has been observed, with probability 2.5 x 10 to the minus 6 power ergs/s to emit 1000 GeV gamma-rays with a time averaged energy flux of 6 to 10 to the 35th power. Author

N85-33974*# Academy of Sciences of the Armenian SSR, Erevan (USSR).
PRIMARY GAMMA-RAYS WITH E GAMMA < OR = TO 10(15) eV: EVIDENCE FOR ULTRAHIGH ENERGY PARTICLE ACCELERATION IN GALACTIC SOURCES
F. A. Aharonian, E. A. Mamidjanian, S. I. Nikolsky (Academy of Sciences, USSR, Moscow), and E. I. Tukish (Academy of Sciences, USSR, Moscow) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 255-258 refs (For primary document see N85-33902 22-93)
(OG-2.6-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The recently observed primary ultra high energy gamma-rays (UHEGR) testify to the cosmic ray (CR) acceleration in the Galaxy. The available data may be interpreted as gamma-ray production due to photomeson production in CR sources. Author

N85-33975*# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
SEARCH FOR THE GAMMA-RAY FLUXES WITH ENERGIES ABOVE 10915) eV FROM VARIOUS OBJECTS
Yu. A. Fomin, G. B. Khristiansen, G. V. Kulikov, V. L. Nazarov, A. A. Silaev, V. I. Solovyeva, and A. V. Trubitsyn *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 259-262 refs (For primary document see N85-33902 22-93)
(OG-2.6-14) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Considerable interest has developed in the search for local sources of superhigh-energy gamma-rays. The experimental data obtained with the extensive air showers (EAS) array of the Moscow State University are analyzed with a view to searching for the superhigh-energy gamma-rays from various objects and regions of the Galaxy. B.W.

N85-33976*# Tata Inst. of Fundamental Research, Bombay (India).
SEARCH FOR TeV GAMMA RAYS FROM EXTRAGALACTIC SOURCES AND THE GALACTIC CENTER Abstract Only
P. N. Bhat, S. K. Gupta, P. V. RamanaMurthy, S. Swaminathan, and P. R. Vishwanath *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 263 (For primary document see N85-33902 22-93)
(OG-2.7-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Ooty atmospheric Cerenkov array was used in 1982-83 to see if the galactic center and the extra-galactic sources 3C 273, Centaurus A emit gamma rays at TeV energies. The ON/OFF method was used wherein the source was tracked for 16 minutes and immediately afterwards, a background region in the same zenith angle range was tracked for the next 16 minutes. Data were taken for approx 15 hours (55 scans) on 3C273, approx 7 hours (26 scans) on Cen A and 5 hours (19 scans) on galactic center. A preliminary analysis involving direct comparison of total rates on and off the source shows no significant excess from any of these orbits. Results of detailed analysis using different energy thresholds are presented. Author

N85-33977*# University Coll., Dublin (Ireland). Dept. of Physics.
SEARCH FOR GAMMA-RAYS FROM M31 AND OTHER EXTRAGALACTIC OBJECTS
M. F. Cawley, D. J. Fegan, K. Gibbs (Harvard-Smithsonian Center for Astrophysics, Amado, Ariz.), P. W. Gorham (Hawaii Univ., Honolulu), R. C. Lamb (Iowa State Univ., Ames), D. F. Liebing (Iowa State Univ., Ames), N. A. Porter, V. J. Stenger (Hawaii Univ., Honolulu), and T. C. Weeles (Harvard-Smithsonian Center for Astrophysics, Amado, Ariz.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 264-267 refs (For primary document see N85-33902 22-93)
(Contracts DE-AC02-82ER-40063; DE-AC02-80ER-10774; DE-AC03-83ER-40103)
(OG-2.7-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Although the existence of fluxes of gamma-rays of energies > 10 to the 12th power eV is now established for galactic sources, the detection of such gamma-rays from extragalactic sources has yet to be independently confirmed in any case. The detection and confirmation of such energetic photons is of great astrophysical importance in the study of production mechanisms for cosmic rays, and other high energy processes in extragalactic objects. Observations of m31 are discussed. It is reported as a 10 to the 12th power eV gamma-ray source. Flux limits on a number of other extragalactic objects chosen for study are given. B.W.

N85-33978*# Lodz Univ. (Poland).
SOME EVIDENCE FOR HIGH ENERGY GAMMA-RAY SOURCES AT LARGE GALACTIC LATITUDES
S. Karakula, J. N. Stamenov (Inst. for Nuclear Research and

Nuclear Energy, Sofia, Bulgaria), and W. Tkaczyk *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 268-271 refs (For primary document see N85-33902 22-93)
(OG-2.7-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The arrival directions of the gamma-quanta with energies of about 10 to 15th power eV which were registrated by Tien Shan experiment were compared with COS-B observations. On the basis of the Monte Carlo simulations it was shown with low probability that arrival directions of Tien Shan gamma-quanta initiated showers are not uniformly distributed. It is shown that in the region not seen by COS-B mission, the high energy gamma-ray sources should be located at position of 90 deg. < 1 sup 11 < 130 deg and b sup 11 > or = 50 deg. The integral intensity of these sources should be I (> 10 to the 15th power eV) = 4.8 + or - 1.7).10 to the 13th power/sq cm/s/str. There is no coincidence between the gamma-quanta registrated by Tien Shan experiment with Geminga intense COS-B gamma source. So it is shown that the integral photon spectrum of Geminga (I(>e) approx E sup-Beta, where Beta = 0.8 for E < 1 GeV) becomes steeper (Beta >1.2) in high energy region with probability 99.9.%. Author

N85-33979*# Tata Inst. of Fundamental Research, Bombay (India).
BALLOON OBSERVATIONS OF HARD X-RAYS FROM NGC 4151 AND AN X-RAY TRANSIENT SOURCE Abstract Only
P. K. Kunte, S. V. Damle, S. Naranan, and D. Venkatesan (Calgary Univ., Alberta) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 272 (For primary document see N85-33902 22-93)
(OG-2.7-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

An X-ray telescope consisting of 400 sq cm phoswich detectors (NaI(Tl)/CsI(Na)) was flown from Hyderabad (India) on 31 October 1980; the field of view was 11 deg x 1 deg FWHM. During a five hour observation at 5 millibars two X-ray sources were seen: (1) the variable Seyfert Galaxy NGC 4151; and (2) a transident of approximately 8 minutes duration in the vicinity of the variable source 4U1444 43 which may be associated with the galaxy NGC 5608. X-ray fluxes and spectra in 18-120 keV X-rays are presented. Author

N85-33980*# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (West Germany).
CEN A OBSERVATION AT MeV-ENERGIES
P. V. Ballmoos, R. Diehl, and V. Schoenfelder *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 273-276 (For primary document see N85-33902 22-93)
(OG-2.7-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

During a balloon flight with the MPI Compton telescope from Uberaba/Brasil gamma-ray emission from the direction of Cen A was observed at MeV-energies. The observed flux connects to the X-ray spectrum of Cen A beyond 0.7 MeV and has a statistical significance of 4.1. The extension beyond 3 MeV has a significance of 3.8. Possible interpretations of the energy spectrum are discussed. Author

N85-33981*# Tata Inst. of Fundamental Research, Bombay (India).
GAMMA-RADIATION WITH E GAMMA > 5 MeV DETECTED FROM SEYFERT GALAXY 3C120 AND REGION WITH 1' = 190 DEG AND b' = 20 DEG
S. V. Damle, M. I. Fradkin (Academy of Sciences (USSR), Moscow), A. F. Iyudin (Moscow Engineering Physics Inst., USSR), V. G. Kirillov-Ugryumov (Moscow Engineering Physics Inst., USSR), Yu. D. Kotov (Moscow Engineering Physics Inst., USSR), L. V. Kurnosova (Academy of Sciences, Moscow, USSR), Yu. V. Smirnov (Moscow Engineering Physics Inst., USSR), and V. N. Yurov (Moscow Engineering Physics Inst., USSR) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 277-280 refs (For primary document see N85-33902 22-93)
(OG-2.8-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The observation of the Galaxy anticenter region in gamma-rays with E gamma = 5 / 100 MeV was made by gamma-telescope Natalya-1 in a balloon flight. The flight was performed at the ceiling 5.1 + or - 0.1 g/sq cm, magnetic cutoff being 17 GV. The description of the instrument and the analysis of the experiment conditions are given. The tracks of electron-positron pairs generated by gamma-quanta in the convertors were detected by wire spark chambers. The recorded events were classified manually by an operator using a graphic display into three classes: pairs, single and bad events. The arrival angle of gamma-quanta and their energy for selected gamma-ray events (pairs and singles) were determined through multiple scattering of pair components in the convertors. On the basis of the data obtained the celestial maps were made in gamma-rays for E sub gamma >5 MeV and E gamma > 20 MeV energy ranges. B.W.

N85-33982*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE UNIVERSAL SPECTRUM OF AGNS AND QSOS
Demosthenes Kazanas *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 281-284 refs Prepared in cooperation with Maryland Univ., College Park (For primary document see N85-33902 22-93)
(OG-2.7-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The effects of the feedback of e(+)-e(-) pair reinjection in a plasma due to photon photon absorption of its own radiation are examined. A mechanism is presented which can produce an electron distribution function that can account for the overall spectral distribution of radiation of AGNs and QSOs and the specific slopes observed in the IR to UV and 2-50 keV bands. It is interesting to note that the necessary condition for this mechanism to work (i.e., most of energy injected at e>>(M sub e)(C sup 2) is realized in the accretion shock model of Kazanas and Ellison. This mechanism involves only one free parameter the compactness of the sources, L/R, whose mean value can also account for the diffuse gamma ray background in terms of AGNs. B.W.

N85-33983*# Hong Kong Univ. Dept. of Physics.
COSMIC GAMMA RAYS FROM QUASARS
M. M. Lau and E. C. M. Young *In its* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 285-288 refs (For primary document see N85-33902 22-93)
(OG-2.7-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The diffuse gamma radiation consists of the galactic and extragalactic components. The latter component is of special interest on account of its cosmological significance. Following the method recently proposed to estimate the gamma ray flux from galaxy clusters, and the detection of gamma rays from the quasars 3C273, the data base of the SAS II satellite was used to estimate the contribution from quasars to the extragalactic gamma ray flux. It is shown that quasars as a whole are significant gamma ray contributors, the average gamma ray flux per quasar in the energy range 35 MeV to 100 Mev being (1.3 + or - 0.9) x .00001 cm(-2)s(-1)sr(-1). Author

N85-33984*# Lodz Univ. (Poland). Inst. of Physics.
SOME EVIDENCE FOR LARGE GRAVITATIONAL REDSHIFT IN SEYFERT GALAXY NGC 4151
W. Tkaczyk and S. Karakula *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 289-292 refs (For primary document see N85-33902 22-93)
(OG-2.7-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The photon spectra of two Seyfert galaxies NGC 4151 and MCG 8-11-11 are good experimentally established in the X-ray and gamma range. The annihilation of the high temperature positrons with cold electrons is proposed as the possible mecha-

nism of photon production in the Seyfert galaxy NGC 4151. The photon spectrum of NGC 4151 with its observed features from the soft X to the gamma ray range is described by annihilation of positrons and electrons at temperatures 3 x 10 to the 12th power K and 10 to the 8th power K respectively. The photon spectra from annihilation of unthermalized plasma with above parameters should be shifted to the lower energy by redshift z = 100. In that case the source of photons should be placed closely to the black hole horizon (r approximately equal to 1.0001 r sub g. Author

N85-33985*# Southampton Univ. (England). Dept. of Physics.
LIMITS ON THE DOPPLER FACTOR IN RELATIVISTIC JETS BY MEANS OF GAMMA-RAY OBSERVATIONS
A. J. Dean and L. Bassani (Consiglio Nazionale delle Ricerche, Bologna, Italy) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 293-296 refs (For primary document see N85-33902 22-93)
(OG-2.7-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A new, simple and potentially useful method for constraining the kinematical parameters of relativistic jets based on gamma ray spectral measurements of Active Galaxies is presented. The application of this method to the Quasar 3C273 leads to a value of the Doppler factor of 3 to 4. This corresponds to jet parameters of mu > 2 and theta < 15 deg in good agreement with the values estimated independently from radio observations of superluminal motion. For the particular case of 3C273, the results are also compared to those given by a similar technique based on the comparison of the X-ray observational data with the synchrotron self Compton prediction from radio measurements. The application of the proposed technique to a significant sample of active galaxies as a result of future gamma ray surveys of the sky is briefly discussed, particularly with respect to possible ways to constrain the cosmological constants H sub o and q sub o.
Author

N85-33986*# Adelaide Univ. (Australia). Dept. of Physics.
ENERGY SPECTRUM OF EXTRAGALACTIC GAMMA-RAY SOURCES
R. J. Protheroe *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 297-300 refs Sponsored in part by ARGS (For primary document see N85-33902 22-93)
(OG-2.7-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The result of Monte Carlo electron photon cascade calculations for propagation of gamma rays through regions of extragalactic space containing no magnetic field are given. These calculations then provide upper limits to the expected flux from extragalactic sources. Since gamma rays in the 10 to the 14th power eV to 10 to the 17th power eV energy range are of interest, interactions of electrons and photons with the 3 K microwave background radiation are considered. To obtain an upper limit to the expected gamma ray flux from sources, the intergalactic field is assumed to be so low that it can be ignored. Interactions with photons of the near-infrared background radiation are not considered here although these will have important implications for gamma rays below 10 to the 14th power eV if the near infrared background radiation is universal. Interaction lengths of electrons and photons in the microwave background radiation at a temperature of 2.96 K were calculated and are given. Author

N85-33987*# Academy of Sciences of the Armenian SSR, Erevan (USSR).
ULTRAHIGH ENERGY GAMMA RAYS: CARRIERS OF COSMOLOGICAL INFORMATION
F. A. Aharonian and A. M. Atoyan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 301-304 refs (For primary document see N85-33902 22-93)
(OG-2.7-14) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Observational data being the basis of contemporary cosmological models are not numerous: Hubble law of redshift for galaxies, element abundances, and observation of cosmic microwave background radiation (MBR). The significance of MBR discovery predicted in the Big-Band model is particularly stressed. Radio astronomical measurements give an information on MBR only near the Earth. Experimental confirmation of evolution of MBR, i.e., its probing in remote epochs, might obviously present a direct verification of the hypothesis of hot expanding Universe. The carriers of similar cosmological information should be particles which, firstly, effectively interact with MBR, and secondly, make it possible to identify unambiguously the epoch of interaction. A possibility to verify a number of cosmological hypotheses by searching the cutoffs in spectra of ultrahigh energy gamma-rays (UHEGR) from extragalactic sources is discussed. Author

N85-33988*# Academy of Sciences (USSR), Moscow. Inst. for Nuclear Research.
ON SOME PROBLEMS OF GAMMA-ASTRONOMY
V. S. Berezinsky, V. L. Ginzburg, and V. S. Ptuskin *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 305-308 refs (For primary document see N85-33902 22-93)
(OG-2.7-15) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Gamma ray emissions from young supernova remnants are discussed and calculated. The positron annihilation line is also calculated. Decay of charged pions in remnants cause generation of high energy neutrinos. This emission of neutrinos is reviewed. The CR origin and gamma emission from Magellanic clouds help to establish the intensity gradient in the galaxy. This gamma astronomical data is briefly discussed. E.R.

N85-33989*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
LOCAL INTERSTELLAR MEDIUM AND GAMMA-RAY ASTRONOMY
F. Lebrun and J. Paul *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 309-312 refs (For primary document see N85-33902 22-93)
(OG-3.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The recent improvement of the calibration of the galaxy counts used as an interstellar absorption tracer modifies significantly the picture of the local interstellar medium (ISM). Consequently, previous analyses of the gamma ray emission from the local ISM involving galaxy counts have to be revised. The implications regarding the cosmic ray (CR) density in the local ISM are considered and in particular within Loop I, a nearby supernova remnant (SNR). Author

N85-33990*# Leiden Univ. (Netherlands).
INVERSE-COMPTON GAMMA RAYS IN THE GALAXY
J. B. G. M. Bloemen *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 313-316 refs (For primary document see N85-33902 22-93)
(OG-3.1-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Compton gamma rays with energies > 1 MeV largely results from scattering between electrons, with energies > 100 MeV, and photons in the optical and infrared range and the 2.7 K universal blackbody radiation. An empirical model of the inverse Compton (IC) gamma ray production in the Galaxy is presented, using the most recent estimate of the interstellar electron spectrum given by Webber and a combination of optical and infrared observations to determine the galactic distribution of the various components of the interstellar photon field. The present analysis has an improved precision since the spectral distribution of the IC source function as well as that of the interstellar photon field are more accurately taken into account. The exact evaluation of the IC process is applied and different electron distribution models are considered. Author

N85-33991*# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (West Germany).
MULTICOMPONENT ANALYSIS OF TOTAL COS-B GAMMA-RAY DATA AT INTERMEDIATE LATTITUDES
A. W. Strong, J. B. G. M. Bloemen, W. Hemsen, and H. A. Mayer-Hasselwander *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 317-320 (For primary document see N85-33902 22-93)
(OG-3.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The final COS-B database was used to study the gamma ray emission in the latitude range 10 deg < /b/ < 20 deg in terms of a four component model. The emissivity spectrum of the local interstellar medium is derived and compared with that found in previous studies. The intensity-Compton component is determined from the fitting procedure and is in good agreement with theoretical values. Author

N85-33992*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GALACTIC GAMMA-RAY DISTRIBUTION AND THE RADIAL COSMIC RAY GRADIENT
A. K. Harding and F. W. Stecker *In its* 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 321-324 refs (For primary document see N85-33902 22-93)
(OG-3.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The radial distribution is derived of gamma ray emissivity and the cosmic ray intensity in the Galaxy using the final SAS-2 results, the recently corrected COS-B results, and recent CO surveys of the Northern and Southern Galactic Hemispheres. In addition to the 5 kpc ring of enhanced emission, there is evidence for spiral features. A strong increase in the cosmic ray flux is found in the inner Galaxy, particularly in the 5 kpc region, in both halves of the plane. Author

N85-33993*# Ain Shams Univ., Cairo (Egypt). Dept. of Physics.
RADIAL DISTRIBUTION OF COSMIC RAY INTENSITY IN THE GALAXY FROM GAMMA-RAY DATA
A. Goned and A. Wahdan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 325-328 refs (For primary document see N85-33902 22-93)
(OG-3.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The radial distributions of Galactic gamma-ray emissivity and cosmic ray intensity are derived by unfolding the SAS2 line flux data. The results show a marked gradient, with the cosmic ray intensity in the region 3,R,7 kpc being 3 to 4 times as much as locally. There is also an indication for a higher gradient for cosmic rays of lower energy. Author

N85-33994*# Leiden Univ. (Netherlands).
CONSTRAINTS ON THE GALACTIC DISTRIBUTION OF COSMIC RAYS FROM THE COS-B GAMMA-RAY DATA
J. B. G. M. Bloemen, A. W. Strong (Max-Planck-Inst. fuer Extraterrestrische Physik, Garching, West Germany), L. Blitz (Maryland Univ., College Park), R. S. Cohen (Columbia Univ., New York, N.Y.), T. M. Dame (Columbia Univ., New York, N.Y.), D. A. Grabelsky (Columbia Univ., New York, N.Y.), W. Hermsen, F. Lbrun (Commissariat a l'Energie Atomique, Saclay, France), H. A. Mayer-Hasselwander (Max-Planck-Inst. fuer Extraterrestrische Physik, Garching, West Germany), and F. Thaddeus (Columbia Univ., New York, N.Y.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 329-332 refs (For primary document see N85-33902 22-93)
(OG-3.1-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The diffuse component of the galactic high energy gamma rays results mainly from the interaction of CR nuclei and electrons with the nuclei of the interstellar gas. An additional contribution is obtained from the interaction of CR electrons with the interstellar photons through the inverse-Compton (IC) process. Gamma ray astronomy therefore offers an excellent means to study the distribution of CR particles throughout the Galaxy, but it is essential to know the distribution of the target interstellar gas particles, the major constituents being atomic and molecular hydrogen. Large scale millimeter wave surveys of the CO molecule covering more than half of the Milky Way, obtained with the Columbia 1.2 m telescopes, are currently available and are used to trace the H2; the COS-B observations have sufficient resolution and sensitivity to constrain the relation between the integrated CO line intensity and the molecular hydrogen column density. Author

N85-33995*# Max-Planck-Inst. fuer Extraterrestrische Physik, Garching (West Germany).
LOCAL ELECTRON SPECTRUM ABOVE 100 MeV DERIVED FROM GAMMA-RAY EMISSIVITY SPECTRA
A. W. Strong *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 333-335 refs (For primary document see N85-33902 22-93)
(OG-3.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Two new determinations of the local gamma-ray emmissivity spectrum are in good accord and were used to derive constraints on the local electron spectrum. The requirement for an electron intensity above 1 GeV larger than previously believed is confirmed and no low energy upturn is then needed. Auhor

N85-33996*# Bhabha Atomic Research Centre, Kashmir (India). Nuclear Research Lab.
RELEVANCE OF COSMIC GAMMA RAYS TO THE MASS OF GAS IN THE GALAXY
C. L. Bhat, C. J. Mayer (Durham Univ.), and A. W. Wolfendale (Durham Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 336-337 refs (For primary document see N85-33902 22-93)
(OG-3.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The bulk of the diffuse gamma-ray flux comes from cosmic ray interactions in the interstellar medium. A knowledge of the large scale spatial distribution of the Galactic gamma-rays and the cosmic rays enables the distribution of the target gas to be examined. An approach of this type is used here to estimate the total mass of the molecular gas in the galaxy. It is shown to be much less than that previously derived, viz., approximately 6 x 10 to the 8th power solar masses within the solar radius as against approximately 3 x 10 to the 9th power based on 2.6 mm CO measurements. Author

N85-33997*# Birmingham Univ. (England). Dept. of Space Research.
COS-B GAMMA-RAY SOURCES AND INTERSTELLAR GAS
A. M. T. Pollock, K. Bennett (ESA. European Space Technology Center, Noordwijk, Netherlands), G. F. Bignami (Consiglio Nazionale delle Ricerche, Milan, Italy), J. B. G. M. Bloemen (Lab. for Space Research, Leiden, Netherlands), R. Buccheri (Consiglio Nazionale delle Ricerche, Palermo, Italy), P. A. Caraveo (Consiglio Nazionale delle Ricerche, Milan, Italy), W. Hermsen (Lab. for Space Research, Leiden, Netherlands), G. Kanbach (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany), F. Lebrun (Commissariat a l'Energie Atomique, Saclay, France), H. A. Mayer-Hasselwander (Max-Planck-Inst. fuer Physik und Astrophysik, Garching, West Germany) et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 338-341 refs (For primary document see N85-33902 22-93)
(OG-3.1-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Of the gamma-radiation observed above 100 MeV only a few percent is due to the catalogued sources which are viewed against intense background mission from the Galactic plane. There has been considerable recent success in modelling the Galactic plane emission as the interactions of cosmic rays with atomic and molecular interstellar gas; Bloemen, et al., demonstrate that large angular scale features of the observations are well reproduced in

this way. By extending the analysis to small angular scales, which of the eCG sources might be due to conventional levels of cosmic rays within clumps of gas are shown and which cannot be so explained. With the use of a more sophisticated model the results presented improve and extend those of an earlier report. So far only the data above 300 MeV is used where the instrument's angular resolution is at its best. Author

N85-33998*# Bhabha Atomic Research Centre, Kashmir (India). Nuclear Research Lab.

EXCESS GAMMA RAYS FROM THE LOOP I SUPERNOVA REMNANT

C. L. Bhat (Durham Univ.), C. J. Mayer, and A. W. Wolfendale (Durham Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 342-344 refs (For primary document see N85-33902 22-93)

(OG-3.1-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Evidence is presented for an excess of cosmic ray intensity within the Loop I supernova remnant based on an interpretation of the observed distribution of gamma-rays across the remnant and the column densities of the associated gas. A strong case can thus be made for the bulk of the cosmic radiation (E , 10 to the 11th power eV) being produced in the Galactic supernova remnants. Author

N85-33999*# Bhabha Atomic Research Centre, Kashmir (India). Nuclear Research Lab.

LONG TERM VARIABILITY OF THE COSMIC RAY INTENSITY

C. L. Bhat, B. P. Houston (Durham Univ.), C. J. Mayer (Durham Univ.), and A. W. Wolfendale (Durham Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 345-348 refs (For primary document see N85-33902 22-93)

(OG-3.1-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

In a previous paper Bhat, et al., assess the evidence for the continuing acceleration of cosmic rays in the Loop I supernova remnant. The enhanced gamma-ray emission is found consistent with the Blandford and Cowie model for particle acceleration at the remnant shock wave. The contributions of other supernovae remnants to the galactic cosmic ray energy density are now considered, paying anisotropy of cosmic rays accelerated by local supernovae (< 100 pc). The results are compared with geophysical data on the fluctuations in the cosmic ray intensity over the previous one billion years. Author

N85-34000*# California Univ., San Diego. Center for Astrophysics and Space Sciences.

SPECTRUM OF THE GAMMA-RAY DIFFUSE COMPONENT OBSERVED FROM HEAO-1

D. E. Gruber, J. L. Matteson, G. V. Jung, and R. L. Kinzer (Naval Research Lab., Washington, D.C.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 349-352 refs (For primary document see N85-33902 22-93)

(Grant NAG8-499)

(OG-3.1-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The spectrum of the diffuse X and gamma ray background was measured between 15 keV and 4 MeV with the scintillation detectors aboard the HEAO 1 satellite. The apertures of the detectors were modulated on time scales of hours and the difference in counting rates measured the diffuse component flux. The observed spectrum is presented and compared with other measurements. At least two components are indicated, one below -100 keV and the other above. Possible origins are discussed. Author

N85-34001*# Durham Univ. (England). Center for Space Research.

SMM DETECTION OF INTERSTELLAR Al-26 GAMMA RADIATION

G. H. Share, R. L. Kinzer, E. L. Chupp (New Hampshire Univ.), D. J. Forrest (New Hampshire Univ.), and E. Rieger (Max-Planck-Inst. fuer Extraterrestriche Physik, Garching, West Germany) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 353-356 refs (For primary document see N85-33902 22-93)

(Contract NAS5-28609; NASA Order S-14513-D)

(OG-3.2-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The gamma ray spectrometer on the Solar Maximum Mission Satellite has detected the interstellar Al-26 line when the Galactic center traversed its aperture. The center of the emission is consistent with the location of the Galactic center, but the spatial distribution is presently not well defined. The total flux in the direction of the Galactic center is 4.3 + or - 0.4) x .0001 gamma/sq cm-s-rad for an assumed population I distribution. Author

N85-34002*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

GALACTIC DISTRIBUTION OF INTERSTELLAR Al-26

W. A. Mahoney, J. C. Higdon, J. C. Ling, W. A. Wheaton, and A. S. Jacobson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 357-360 refs (For primary document see N85-33902 22-93)

(OG-3.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A narrow cosmic gamma ray line at 1809 keV was discovered which was interpreted as resulting from the decay of approximately 3 M sub theta of Al-26 residing in the galactic disk. While its intrinsic width was unresolved by the HEAO 3 spectrometer, a (1 sigma) limit of 3 keV FWHM was obtained; this corresponds to bulk motions of v < 250 km/s, which is consistent with material at rest in the ISM. Sites which have been suggested include type II supernovae and massive stars which are members of the extreme population I, as well as novae and red giants which are associated with an older disk population. The HEAO 3 data was used to distinguish between these two stellar populations. Author

N85-34003*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.

GAMMA-RAY LINE EMISSION FROM Al-26 PRODUCED BY WOLF-RAYET STARS

N. Prantzos, M. Casse, M. Gros, C. Doom (Vrije Univ., Brussels, Belgium), and M. Arnould (Brussels Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 361-364 refs (For primary document see N85-33902 22-93)

(OG-3.2-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The recent satellite observations of the 1.8 MeV line from the decay of Al-26 has given a new impetus to the study of the nucleosynthesis of Al-26. The production and ejection of Al-26 by massive mass-losing stars (Of and WR stars) is discussed in the light of recent stellar models. The longitude distribution of the Al-26 gamma ray line emission produced by the galactic collection of WR stars is derived based on various estimates of their radial distribution. This longitude profile provides: (1) a specific signature of massive stars on the background of other potential Al-26 sources, as novae, supernovae, certain red giants and possibly AGB stars; and (2) a possible tool to improve the data analysis of the HEAO 3 and SMM experiments. M.G.

N85-34004*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DIFFUSE GALACTIC ANNIHILATION RADIATION FROM SUPERNOVA NUCLEOSYNTHESIS

J. C. Higdon *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 365-368 refs (For primary document see N85-33902 22-93)

(OG-3.2-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The propagation of MeV positrons in the outer ejecta of type

l supernovae was investigated. It was found that the positrons created at times of approx 100 days propagated along magnetic field lines in the outer ejecta without any appreciable pitch-angle scattering or excitation of hydromagnetic waves. The lack of significant pitch-angle scattering is well consistent with models of wave excitation and scattering by resonant interactions. This occurs because time periods to scatter the particles or to excite waves are significantly longer than escape times. Thus it is expected that, when positrons are not coupled to the ejecta by Coulomb collisions, they escape from the relatively cold, dense ejecta and reside predominantly in the tenuous, hotter, shock-heated interstellar gas. In the tenuous shock-heated gas the positron lifetime against annihilation is much greater than lifetimes in the dense ejectra. Thus the production of steady-state diffuse annihilation radiation by some fraction of these escaped positrons seems probable. M.G.

N85-34005*# Naval Research Lab., Washington, D. C.
GAMMA RAY LINE PRODUCTION FROM COSMIC RAY SPALLATION REACTIONS
Rein Silberberg, C. H. Tsao, and John R. Letaw (Severn Communications Corp.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 1 Aug. 1985 p 369-372 refs (For primary document see N85-33902 22-93)
Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The gamma ray line intensities due to cosmic ray spallation reactions in clouds, the galactic disk and accreting binary pulsars are calculated. With the most favorable plausible assumptions, only a few lines may be detectable to the level of 0.0000001 per sq. cm per sec. The intensities are compared with those generated in nuclear excitation reactions. M.G.

N85-34006*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NINETEENTH INTERNATIONAL COSMIC RAY CONFERENCE. OG SESSIONS, VOLUME 2
Frank C. Jones, comp. Washington Aug. 1985 441 p refs Conf. held in La Jolla, Calif., 11-23 Aug. 1985 8 Vol.
(NASA-CP-2376-Vol-2; NAS 1.55:2376-Vol-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Contributed papers addressing cosmic ray origin and galactic phenomena are compiled. Topic areas include the composition, spectra, and anisotropy of cosmic ray nuclei with energies > and < 1 TeV, isotopes, antiprotons and related subjects, and electrons, positrons, and measurements of synchrotron radiation. For individual titles, see N85-34007 through N85-34110.

N85-34007*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
ABSOLUTE RIGIDITY SPECTRUM OF PROTONS AND HELIUM NUCLEI ABOVE 10 GV/c
R. L. Golden (New Mexico State Univ.), S. Horan (New Mexico State Univ.), B. Kimbell (New Mexico State Univ.), G. D. Badhwar, J. L. Lacy, J. E. Zipse, R. R. Daniel (Tata Inst. of Fundamental Research, Bombay), and S. A. Stephens (Tata Inst. of Fundamental Research, Bombay) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 1-3 refs (For primary document see N85-34006 22-93)
(OG-4.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Proton and helium nuclei differential spectra were gathered with a balloon borne magnet spectrometer. The data were fitted to the assumption that the differential flux can be represented by a power law in rigidity. In the rigidity range 10 to 25 GV/c the spectral indices were found to be -(2.74 plus or minus 0.04) for protons and -(2.71 plus or minus 0.05) for helium nuclei. A brief discussion is given by systematic errors. R.J.F.

N85-34008*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
SOURCE SPECTRAL INDEX OF HEAVY COSMIC RAY NUCLEI
J. J. Engelmann, P. Ferrando, L. Koch-Miramond, P. Masse, A. Soutoul, and W. R. Webber (New Hampshire Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 4-7 refs (For primary document see N85-34006 22-93)
(OG-4.1-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

From the energy spectra of the heavy nuclei observed by the French-Danish experiment on HEAO-3, the source spectra of the mostly primary nuclei (C, O, Ne, Mg, Si, Ca and Fe) in the framework of an energy dependent leaky box model (Engelmann, et al., 1985) were derived. The energy dependence of the escape length was derived from the observed B/C and sub-iron/iron ratios and the presently available cross sections for C and Fe on H nuclei (Koch-Miramond, et al., 1983). A good fit to the source energy spectra of all these nuclei was obtained by a power law in momentum with an exponent gamma = -2.4+0.05 for the energy range 1 to 25GeV/n (Engelmann, et al., 1985). Comparison with data obtained at higher energy suggested a progressive flattening of these spectra. More accurate spectral indices are sought by using better values of the escape length based on the latest cross section measurements (Webber 1984, Soutoul, et al., this conference). The aim is also to extend the analysis to lower energies down to 0.4GeV/n (kinetic energy observed near Earth), using data obtained by other groups. The only nuclei for which a good data base is possessed in a broad range of energies are O and Fe, so the present study is restricted to these two elements. R.J.F.

N85-34009*# Commissariat a l'Energie Atomique, Saclay (France).
CHARGE AND ENERGY DEPENDENCE OF THE RESIDENCE TIME OF COSMIC RAY NUCLEI BELOW 15 GeV/NUCLEON
A. Soutoul, J. J. Engelmann, Ph. Ferrando, L. Koch-Miramond, P. Masse, and W. R. Webber (New Hampshire Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 8-11 refs (For primary document see N85-34006 22-93)
(OG-4.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The relative abundance of nuclear species measured in cosmic rays at Earth has often been interpreted with the simple leaky box model. For this model to be consistent an essential requirement is that the escape length does not depend on the nuclear species. The discrepancy between escape length values derived from iron secondaries and from the B/C ratio was identified by Garcia-Munoz and his co-workers using a large amount of experimental data. Ormes and Protheroe found a similar trend in the HEAO data although they questioned its significance against uncertainties. They also showed that the change in the B/C ratio values implies a decrease of the residence time of cosmic rays at low energies in conflict with the diffusive convective picture. These conclusions crucially depend on the partial cross section values and their uncertainties. Recently new accurate cross sections of key importance for propagation calculations have been measured. Their statistical uncertainties are often better than 4% and their values significantly different from those previously accepted. Here, these new cross sections are used to compare the observed B/C+O and (Sc to Cr)/Fe ratio to those predicted with the simple leaky box model. R.J.F.

N85-34010*# Tata Inst. of Fundamental Research, Bombay (India).
RELATIVE ABUNDANCES OF SUB-IRON TO IRON NUCLEI IN LOW ENERGY (50-250 MeV/N) COSMIC RAYS AS OBSERVED IN THE SKYLAB EXPERIMENT
N. Durgaprasad, J. S. Yadav, and S. Biswas *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 12-15 refs (For primary document see N85-34006 22-93)
(OG-4.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A Lexan polycarbonate detector exposed on the exterior of Skylab-3 for 73 days during a solar quiet period was used to study the relative abundances of calcium to nickel ions in low

energy cosmic rays of 50 to 250 MeV/N. The method of charge identification is based on the measurement of conelength (L) and residual range (R) of these particles in various Lexan sheets. Since more than one cone (sometimes as many as five) is observed and is measured, the charge accuracy becomes precise and accurate. The ratio of (calcium to manganese) to (iron and cobalt) obtained at three energy intervals of 50 to 80, 80 to 150, 150 to 250 and 50 to 250 MeV/N are 7.6 plus or minus 3.8, 2.7 plus or minus 0.8, 1.4 plus or minus 0.6 and 3.3 plus or minus 0.7 respectively. These data thus indicate a large increase of this ratio with decreasing energy. The origin of this strong energy dependence is not understood at present. Author

N85-34011*# New Hampshire Univ., Durham. Space Science Center.

COSMIC RAY CHARGE AND ENERGY SPECTRUM MEASUREMENTS USING A NEW LARGE AREA CERENKOV X dE/dx TELESCOPE

W. R. Webber, J. C. Kish, and D. A. Schrier *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 16-19 refs (For primary document see N85-34006 22-93) (Grant NGR-30-002-052)

(OG-4.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

In September, 1981, a new 0.5 square meter ster cosmic ray telescope was flown to study the charge composition and energy spectrum of cosmic ray nuclei between 0.3 and 4 GeV/nuc. A high resolution Cerenkov counter, and three dE/dx measuring scintillation counters, including two position scintillators were contained in the telescope used for the charge and energy spectrum measurements. The analysis procedures did not require any large charge or energy dependent corrections, and absolute fluxes could be obtained to an accuracy approximately 5%. The spectral measurements made in 1981, at a time of extreme solar modulation, could be compared with measurements with a similar telescope made by our group in 1977, at a time of minimum modulation and can be used to derive absolute intensity values for the HEAO measurements made in 1979 to 80. Using both data sets precise energy spectra and abundance ratios can be derived over the entire energy range from 0.3 to greater than 15 GeV/nuc. R.J.F.

N85-34012*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A MEASUREMENT OF THE COSMIC RAY ELEMENTS C TO Fe IN THE TWO ENERGY INTERVALS 0.5-2.0 GeV/n AND 20-60 GeV/n

J. H. Derrickson, T. A. Parnell, J. W. Watts, and J. C. Gregory (Alabama Univ., Huntsville) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 20-23 refs (For primary document see N85-34006 22-93)

(OG-4.1-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The study of the cosmic ray abundances beyond 20 GeV/n provides additional information on the propagation and containment of the cosmic rays in the galaxy. Since the average amount of interstellar material traversed by cosmic rays decreases as its energy increases, the source composition undergoes less distortion in this higher energy region. However, data over a wide energy range is necessary to study propagation parameters. Some measurements of some of the primary cosmic ray abundance ratios at both low (near 2 GeV/n) and high (above 20 GeV/n) energy are given and compared to the predictions of the leaky box mode. In particular, the integrated values (above 23.7 GeV/n) for the more abundant cosmic ray elements in the interval C through Fe and the differential flux for carbon, oxygen, and the Ne, Mg, Si group are presented. Limited statistics prevented the inclusion of the odd Z elements. Author

N85-34013*# Washington Univ., St. Louis, Mo. Dept. of Physics.

RELATIVE ABUNDANCES OF ELEMENTS (20 > OR = Z > OR = 28) AT ENERGIES UP TO 70 GeV/amu USING RELATIVISTIC RISE IN ION CHAMBERS

S. D. Barthelmy, M. H. Israel, and J. Klarmann *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 24-27 refs (For primary document see N85-34006 22-93) (Grant NGR-267-008-001)

(OG-4.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The results of a new balloon borne cosmic ray detector flown from Palestine, TX in Sept., 1982 are discussed. The exposure of 62 square meter-ster-hr is sufficient to prove the concept of using gas ionization chambers as energy measuring devices in the relativistic rise region. The abundances, relative Fe-26, of the pure secondaries Cr-22 and Ti-24, the pure primary Ni26, and the mixed primary and secondary Ca-20 between 6 and 70GeV/amu were measured. Author

N85-34014*# Washington Univ., St. Louis, Mo.

ENERGY SPECTRA OF ELEMENTS WITH 18 > OR = Z > OR = 28 BETWEEN 10 AND 300 GeV/amu

Michael D. Jones, J. Klarmann, E. C. Stone (California Inst. of Technology, Pasadena), C. J. Waddington (Minnesota Univ.), W. R. Binns, T. L. Garrard (California Inst. of Technology, Pasadena), and M. H. Israel *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 28-31 refs (For primary document see N85-34006 22-93)

(Contracts NAS8-498; NAS8-500; NAS8-502; Grants NGR-05-002-160; NGR-24-005-050; NGR-26-008-0001)

(OG-4.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The HEAO-3 Heavy Nuclei Experiment is composed of ionization chambers above and below a plastic Cerenkov counter. The energy dependence of the abundances of elements with atomic number, Z, between 18 and 28 at very high energies where they are rare and thus need the large area x time are measured. The measurements of the Danish-French HEAO-3 experiment (Englemann,, et al., 1983) are extended to higher energies, using the relativistic rise of ionization signal as a measure of energy. Source abundances for Ar and Ca were determined. R.J.F.

N85-34015*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PRIMARY COSMIC RAY SPECTRA IN THE RANGE 20-60 GeV/n

T. H. Burnett (Washington Univ.), S. Dake (Kobe Univ.), J. H. Derrickson, M. Fuki (Okayama Univ. of Science), W. F. Fountain, J. C. Gregory (Alabama Univ., Huntsville), T. Hayashi (Kobe Univ.), T. Hayashi (Alabama Univ., Huntsville), R. Holynski (Inst. for Nuclear Physics, Krakow), and J. Iwai (Washington Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 32-35 refs (For primary document see N85-34006 22-93)

(OG-4.1-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Energy spectra for primary cosmic rays C-Fe above 20 GeV/n were measured on a balloon flight from Greenville S.C. in June 1982 with a hybrid electronic counter-emulsion chamber experiment. Fluxes above the atmosphere appear in general agreement with previously published values. The heavy events included in this data will be used along with the JACEE passive chamber data to provide a heavy composition direct measurement from 10 to the 12th power to approximately 10 to the 15th power eV total energy. Author

N85-34016*# Utsunomiya Univ. (Japan). Faculty of Education.

ENERGY SPECTRUM OF COSMIC-RAY IRON NUCLEUS OBSERVED WITH EMULSION CHAMBER

Yoshihiro Sato, Etuo Shimada, Itaru Ohta, Shigeki Tasaka (Gifu Univ.), Shinichiro Tanaka (Gifu Univ.), Hisahiko Sugimoto (Sagami Inst. of Technology), Kunio Taira (Sagami Inst. of Technology), and Nobuto Tateyama (Kanagawa Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug.

1985 p 36-39 refs (For primary document see N85-34006 22-93)
(OG-4.1-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Energy spectrum of cosmic-ray Fe-nucleus has been measured from 4 GeV per nucleon to beyond 100 GeV per nucleon. The data were obtained using emulsion chambers on a balloon from Sanriku, Japan. The energies were estimated by the opening angle method after calibrated using 1.88 GeV per nucleon Fe collisions. The spectrum of Fe is approximately E-2.5 in the range from 10 to 200 GeV per nucleon. This result is in good agreement with those of other experiments. Author

N85-34017*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENT OF THE IRON SPECTRUM FROM 60 TO 200 GeV PER NUCLEON
R. E. Streitmatter, V. K. Balasubrahmanyan, J. F. Ormes, and B. S. Acharya (National Academy of Science/National Research Council) *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 40-43 refs (For primary document see N85-34006 22-93)
(OG-4.1-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The high energy gas Cerenkov Spectrometer (HEGCS) was flown by balloon from Palestine, Texas on September 30, 1983. The instrument maintained an altitude of 118,000 ft (4.7 g/sq cms) for 6 hours. Details of the ongoing data analysis and preliminary results on the Fe spectrum to 10 to the 13th power eV/nucleus are given. Author

N85-34018*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY NUCLEI OF ENERGY < 50 GeV/NUC
V. K. Balasubrahmanyan, R. E. Streitmatter, and J. F. Ormes *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 44-47 refs (For primary document see N85-34006 22-93)
(OG-4.1-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Preliminary results from the High Energy Gas Cerenkov Spectrometer indicate that the sub-iron to iron ratio increases beyond 100 GeV/nucleon. This surprising finding is examined in light of various models for the origin and propagation of galactic cosmic rays. Author

N85-34019*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMPOSITION AND ENERGY SPECTRA OF COSMIC RAY NUCLEI ABOVE 500 GeV/NUCLEON FROM THE JACEE EMULSION CHAMBERS
T. H. Burnett (Alabama Univ., Huntsville), S. Dake (Kobe Univ.), J. H. Derrickson, W. F. Fountain, M. Fuki (Okayama Univ. of Science), J. C. Gregory (Alabama Univ., Huntsville), T. Hayashi (Waseda Univ., Tokyo), R. Holynski (Inst. of Nuclear Physics, Krakow), J. Iwai (Washington Univ., Seattle), and W. V. Jones (Louisiana State Univ., Baton Rouge) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 48-51 refs Sponsored in part by DOE, NSF, ICR, JPS, and Kashima Foundation (For primary document see N85-34006 22-93)
(OG-4.1-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The composition and energy spectra of charge groups (C - 0), (Ne - S), and (Z approximately > 17) above 500 GeV/nucleon from the experiments of JACEE series balloonborne emulsion chambers are reported. Studies of cosmic ray elemental composition at higher energies provide information on propagation through interstellar space, acceleration mechanisms, and their sources. One of the present interests is the elemental composition at energies above 100 GeV/nucleon. Statistically sufficient data in this energy region can be decisive in judgment of propagation models from the ratios of SECONDARY/PRIMARY and source spectra (acceleration mechanism), as well as speculative contributions of different sources from the ratios of PRIMARY/PRIMARY. At much higher energies, i.e., around 10 to the 15th power eV, data from direct observation will give hints on the knee problem, as to whether they favor an escape effect possibly governed by magnetic rigidity above 10 to the 16th power eV. R.J.F.

N85-34020*# Moscow State Univ. (USSR). Inst. of Nuclear Physics.
CHARGE COMPOSITION AND ENERGY SPECTRAL OF COSMIC RAY PRIMARY PARTICLES FOR ENERGIES HIGHER THAN 1 TeV
S. N. Vernov, I. P. Ivanenko, N. L. Grigorov, Yu. V. Basina, P. V. Vakulov, Yu. Ya. Vasilyev, R. M. Golinskaya, L. B. Grigoryeva, D. A. Zhuravlev, and V. I. Zatsepin *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 52-55 refs (For primary document see N85-34006 22-93)
(OG-4.1-14) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Onboard the Cosmos-I543 satellite an experiment was performed to investigate the charge composition and primary cosmic ray energy spectrum for energies higher than I TeV. Preliminary experimental data are reported. Author

N85-34021*# Chicago Univ., Ill. Dept. of Physics.
INTERSTELLAR PROPAGATION AND THE ISOTOPIC COMPOSITION OF HYDROGEN IN THE GALACTIC COSMIC RAYS
James J. Beatty *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 56-59 refs (For primary document see N85-34006 22-93)
(Contract NAS5-28442; Grant NGL-14-001-006)
(OG-4.2-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Preliminary results of a study of the propagation of the quartet of stable isotopes of hydrogen and helium are reported. A mean pathlength of 7.5 + or - 0.5 g/sq cms at approximately 300 MeV/nucleon is required to explain the low energy deuterium spectrum. This pathlength is consistent with pathlengths derived from the elements with Z > 2, but is a (He-3/He-4) measurement of Jordan and P. Meyer (1984). The propagation calculations reported here incorporate the preliminary results of an updated nuclear interaction cross section survey covering the period since the review by J. P. Meyer (1972). Author

N85-34022*# Delaware Univ., Newark.
MEASUREMENTS OF GALACTIC HYDROGEN AND HELIUM ISOTOPES FROM 1978 THROUGH 1983
Paul Evenson, Richard Kroeger (Chicago Univ.), Peter Meyer (Chicago Univ.), and Dietrich Miller (Chicago Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 60-63 refs (For primary document see N85-34006 22-93)
(Contract NAS5-26680; Grants NsG7-464; NGL-14-001-005)
(OG-4.2-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The differential flux of the hydrogen and helium isotopes was measured using an instrument on the ISEE-3 spacecraft during solar quiet time periods from August 1978 through December 1983. These measurements cover the energy range from 26 MeV/nucleon through 138 MeV/nucleon for both H-1 and He-4, from 24 to 89 MeV/nucleon for H-2, and from 43 to 146 solar activity varied from near minimum to maximum conditions causing the observed flux of galactic cosmic rays to modulate by an order of magnitude. To describe the propagation in the galaxy, it was found that the standard leaky box approximation with an escape path length of 6.7 g/sq cms forms a self consistent model for the light cosmic ray nuclei at the observed energies. Author

N85-34023*# California Inst. of Tech., Pasadena.
COSMIC RAY He-3 MEASUREMENTS
R. A. Mewaldt *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 64-67 refs (For primary document see N85-34006 22-93)
(Contracts NAS5-28441; NAS5-28449; Grant NGR-05-002-160)

(OG-4.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The rare isotopes H-2 and He-3 in cosmic rays are believed to be of secondary origin produced by nuclear interactions of primary H-1 and He-4 with the interstellar medium. There has recently been renewed interest in these isotopes as a result of indications from high energy antiproton, positron, and He-3 observations that the origin of some primary H and He nuclei may differ from that of heavier cosmic rays. A new observation of low energy He-3 is examined. Previously reported He-3 and He-4 measurements at both low and high energies are examined and compared with calculations of the expected He-3 and He-4 ratio at 1 AU. No evidence for an excess of low energy He-3 such as that reported at high energies was found. R.J.F.

N85-34024*# New Mexico State Univ., Las Cruces. Dept. of Electrical and Computer Engineering.

RESULTS OF A SEARCH FOR DEUTERIUM AT 25-50 GC/c USING A MAGNETIC SPECTROMETER

R. L. Golden, S. A. Stephens (Tata Inst. for Fundamental Research, Bombay), and W. R. Webber (New Hampshire Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 68-71 refs (For primary document see N85-34006 22-93)

(OG-4.2-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A method is presented for separately identifying isotopes using a Cerenkov detector and a magnet spectrometer. Simulations of the method are given for separating deuterium from protons. The simulations are compared with data gathered from the 1979 flight of the New Mexico State University balloonborne magnet spectrometer. The simulation and the data show the same general characteristics lending credence to the technique. The data show an apparent deuteron signal which is (11 + or - 3)% of the total sample in the rigidity region 38.5 to 50 GV/c. Until further background analysis and subtraction is performed this should be regarded as an upper limit to the deuteron/(deuteron+proton) ratio. Author

N85-34025*# Maryland Univ., College Park. Dept. of Physics and Astronomy.

PARAMETRIZED ENERGY SPECTRUM OF COSMIC-RAY PROTONS WITH KINETIC ENERGIES DOWN TO 1 GeV

L. C. Tan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 72-75 refs (For primary document see N85-34006 22-93)

(OG-4.2-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A new estimation of the interstellar proton spectrum is made in which the source term of primary protons is taken from shock acceleration theory and the cosmic ray propagation calculation is based on a proposed nonuniform galactic disk model. Author

N85-34026*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

GALACTIC PROPAGATION MODELS CONSISTENT WITH THE COSMIC RAY LIFETIME DERIVED FROM Be-10 MEASUREMENTS

T. Gregory Guzik, John P. Wefel, Moises Garcia-Munoz, and John A. Simpson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 76-79 refs (For primary document see N85-34006 22-93)

(Contract NAS5-25731; Grants NAGw-550; NGL-14-001-006)

(OG-4.3-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Using a propagation calculation with energy dependent parameters, including the depletion of short pathlengths, and incorporating experimental nuclear excitation functions, the variation of the Be-10/Be9 ratio with the matter densities in two nested confinement regions is investigated. It is shown that there is no unique correspondence between a Be-10/Be9 measurement at low energy and the density of matter in the galaxy. Be-10/Be9 measurements at both low and high energy are needed to fully specify the matter densities. Author

N85-34027*# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.

IMPLICATIONS OF NEW MEASUREMENTS OF O-16 + p + C-12,13, N-14,15 FOR THE ABUNDANCES OF C, N ISOTOPES AT THE COSMIC RAY SOURCE

T. G. Guzik, J. P. Wefel, H. J. Crawford (California Univ., Berkeley), D. E. Greiner (California Univ., Lawrence Berkeley Lab.), P. J. Lindstrom (California Univ., Lawrence Berkeley Lab.), W. Schimmerling (California Univ., Lawrence Berkeley Lab.), and T. J. M. Symons (California Univ., Lawrence Berkeley Lab.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 80-83 refs (For primary document see N85-34006 22-93)

(Grant NGR-05-003-513; Contract DE-FG05-84ER-40147)

(OG-4.3-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The fragmentation of a 225 MeV/n O-16 beam was investigated at the Bevalac. Preliminary cross sections for mass = 13, 14, 15 fragments are used to constrain the nuclear excitation functions employed in galactic propagation calculations. Comparison to cosmic ray isotonic data at low energies shows that in the cosmic ray source C-13/C approximately < 2% and N-14/0=3-6%. No source abundance of N-15 is required with the current experimental results. Author

N85-34028*# Chicago Univ., Ill. Dept. of Physics.

THE ISOTOPIC COMPOSITION OF COSMIC RAY CHLORINE

M. E. Wiedenbeck *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 84-87 refs (For primary document see N85-34006 22-93)

(Contract NAS5-20995; Grant NAG5-308)

(OG-4.3-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The isotopic composition of galactic cosmic ray chlorine (approx. = 225 MeV/amu) has been studied using the high energy cosmic ray experiment on the International Sun Earth Explorer 3 (ISEE-3) spacecraft. The abundances of 35C1 and 37C1 are found to be consistent with the secondary production expected from a propagation model developed to account for both light and subiron secondaries. An upper limit on the abundance of the radioactive isotope 36C1 (halflife approx. = 0.3 Myr) is used to set a lower limit on the confinement time of cosmic rays of approximately 1 Myr. Author

N85-34029*# New Hampshire Univ., Durham. Space Science Center.

COSMIC RAY ISOTOPE MEASUREMENTS WITH A NEW CERENKOV X TOTAL ENERGY TELESCOPE

W. R. Webber, J. C. Kish, and D. A. Schrier *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 88-91 refs (For primary document see N85-34006 22-93)

(Grant NGR-30-002-052)

(OG-4.3-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Measurements of the isotopic composition of cosmic nuclei with Z = 7-20 are reported. These measurements were made with a new version of a Cerenkov x total E telescope. Path length and uniformity corrections are made to all counters to a RMS level < 1%. Since the Cerenkov counter is crucial to mass measurements using the C x E technique - special care was taken to optimize the resolution of the 2.4 cm thick Pilot 425 Cerenkov counter. This counter exhibited a beta = 1 muon equivalent LED resolution of 24%, corresponding to a total of 90 p.e. collected at the 1st dynodes of the photomultiplier tubes. Author

N85-34030*# Chicago Univ., Ill. Dept. of Physics.

THE ISOTOPIC COMPOSITION OF COSMIC RAY CALCIUM

K. E. Krombel and M. E. Wiedenbeck *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985

p 92-95 refs (For primary document see N85-34006 22-93)
(Contract NAS5-20995; Grant NAG5-308)
(OG-4.3-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data from the high energy cosmic ray experiment on the international sun earth explorer 3 (ISEE-3) spacecraft have been used to study the isotopic composition of cosmic ray calcium at an energy of approx. 260 MeV/amu. The arriving calcium is found to consist of (32 + or - 6)%. A propagation model consistent with both the light and the subiron secondary element abundances was used for the interpretation of the observed calcium composition. The measured 42Ca+43Ca+44Ca abundance is consistent with the calculated secondary production, while the 40Ca abundance implies a source ratio of 40Ca/Fe = (7.0 + or - 1.7)%. Author

N85-34031*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
A NEW ANALYSIS OF COSMIC RAY ISOTOPES AT 3 GeV/n FROM HEAO3-C2 DATA
P. Ferrando, P. Goret, L. Koch-Miramond, N. Petrou, and A. Soutoul *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 96-99 refs (For primary document see N85-34006 22-93)
(OG-4.3-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Results of mean masses of cosmic rays at energy about 3 GeV/n, for Ne, Al, Mg, Si, S, Ca, and Fe, derived from high energy astronomy observatory 3 data collected by the Danish-French experiment C2 on board (HEAO-3) are presented. A method based upon comparison between observed transmission function and a predicted one computed from a geomagnetic field model was used. Enhancement factors of 2.9 + or - .7 for 22Ne/20Ne, 2.1 + or - .4 for (25Mg+26Mg)/24Mg, and 1.6 + or - .8 for (29Si+30Si)/28Si at GCRS when compared to LG were found. Author

N85-34032*# Danish Space Research Inst., Lundtoftevej.
THE ENERGY DEPENDENCE OF THE NEON-22 EXCESS IN THE COSMIC RADIATION
Nils-Yngve Herrstroem and Niels Lund *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 100-102 refs (For primary document see N85-34006 22-93)
(OG-4.3-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It has been recognized now for some time that the heavy neon isotope, neon-22, is overabundant by a factor of 3 to 4 with respect to neon-22 in the cosmic ray source compared to the ratio of these isotopes in the Solar System. In view of the otherwise remarkable similarity of the chemical composition of the cosmic ray source and the composition of the Solar Energetic Particles, the anomaly regarding the neon isotopes is so much more striking. The observed excess of neon-22 is too large to be explained as a result of the chemical evolution of the Galaxy since the formation of the Solar System. Further information on the origin of the neon-22 excess may come from a comparison of the energy spectra of the two neon isotopes. If the cosmic radiation in the solar neighborhood is a mixture of material from several sources, one of which has an excess of neon-22, then the source energy spectra of neon-20 and neon-22 may differ significantly. G.L.C.

N85-34033*# California Inst. of Tech., Pasadena.
INITIAL RESULTS FROM THE CALTECH/DRSI BALLOON-BORNE ISOTOPE EXPERIMENT
S. M. Schindler, A. Buffington, E. C. Christian, J. E. Grove, K. H. Lau, E. C. Stone, I. L. Rasmussen (Danish Space Research Inst.), and S. Laursen (Danish Space Research Inst.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 103-106 refs (For primary document see N85-34006 22-93)
(Grant NGR-05-006-160)
(OG-4.3-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Caltech/DSRI balloonborne High Energy Isotope Spectrometer Telescope (HEIST) was flown successfully from Palestine, Texas on 14 May, 1984. The experiment was designed to measure cosmic ray isotopic abundances from neon through iron, with incident particle energies from approx. 1.5 to 2.2 GeV/nucleon depending on the element. During approximately 38 hours at float altitude, 100,000 events were recorded with Z > or = 6 and incident energies approx. > 1.5 GeV/nucleon. We present results from the ongoing data analysis associated with both the preflight Bevalac calibration and the flight data. Author

N85-34034*# Chile Univ., Santiago. Lab. de Rayos Cosmicos.
THE INNER GRANULOMETRIC DENSITY OF THE TRACKS IN NUCLEAR EMULSIONS AND ITS APPLICATION TO DETERMINE THE CHEMICAL SPECTRUM OF PRIMARY COSMIC RAY NUCLIDI
G. Alvial *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 107-110 refs (For primary document see N85-34006 22-93)
(OG-4.3-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A method by which inner granulo metric densities of nuclear emulsion tracks can be used to determine the chemical spectrum of primary cosmic ray nuclei is presented. G.L.C.

N85-34035*# Rikkyo Univ., Tokyo (Japan). Dept. of Physics.
OBSERVATIONS OF ULTRAHEAVY COSMIC RAY PARTICLES AT 10 GV CUTOFF RIGIDITY
T. Yanagimachi, K. Hisano, K. Ito, S. Kobayashi, T. Doke (Waseda Univ.), R. Hamasaki (Waseda Univ.), T. Hayashi (Waseda Univ.), T. Yakenaka (Waseda Univ.), and K. Nagata (Tamagawa Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 111-114 refs (For primary document see N85-34006 22-93)
(OG-4.4-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Ultraheavy cosmic ray particles with Z > 45 and Fe were observed in two balloon flights at a mean geomagnetic cutoff rigidity of 10 GV. Fluxes of these particles at the top of the atmosphere are presented. A ratio of (Z > 45)/(Fe) is compared with other experimental results. The ratio decreases with increasing energy in the energy range from 1 to 10 GeV/amu. A possibility is presented to explain the variation of the ratio with energy. Author

N85-34036*# Bristol Univ. (England). Physics Lab.
ARIEL 6 MEASUREMENTS OF ULTRA-HEAVY COSMIC RAY FLUXES IN THE REGION 34 > OR = Z > OR = 48
P. H. Fowler, M. R. W. Masheder, R. T. Moses, R. N. F. Walker, A. Worley, and A. M. Gay *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 115-118 refs Sponsored in part by UK Science and Engineering Research Council. (For primary document see N85-34006 22-93)
(OG-4.4-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Ariel VI satellite was launched by NASA on a Scout rocket on 3rd June 1979 from Wallops Island, Virginia, USA, into a near circular 625 km orbit inclined at 55 deg. It carried a spherical cosmic ray detector designed by a group from Bristol University. A spherical aluminum vessel of diameter 75 cm contains a gas scintillation mixture and a thin spherical shell of Pilot 425 plastic, and forms a single optical cavity viewed by 16 photomultipliers. Particle tracks through the detector may be characterized by their impact parameter p and by whether or not they pass through the cup of plastic scintillator placed between the sphere and the spacecraft body (referred to below as the Anti-Coincidence Detector or ACD). Individual particle charges are determined by separately measuring the gas scintillation and the Cerenkov emission from the plastic shell. This is possible because of the quite different distribution in time of these emissions. G.L.C.

N85-34037*# Bristol Univ. (England). Physics Lab.
ARIEL 6 MEASUREMENTS OF ULTRA-HEAVY COSMIC RAY

FLUXES IN THE REGION Z < OR = 48

P. H. Fowler, M. R. W. Masheder, R. T. Moses, R. N. F. Walker, A. Worley, and A. M. Gay *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 119-122 refs Sponsored in part by UK Science and Engineering Research Council (For primary document see N85-34006 22-93)

(OG-4.4-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

For this re-analysis of the Ariel VI data, the contribution of non Z square effects to the restricted energy loss and to Cerenkov radiation in the Bristol sphere has been evaluated using the Mott cross section ratios and the non-relativistic Bloch correction. Results obtained were similar in form to those derived for HEAO3 but with maximum deviations approximately 10% rather than 15% for the Mott term, corresponding to a thinner detector. Because of the large uncertainties in the parameters involved, no relativistic Bloch term was included. In addition the experiments on the HEAO detector make the application of a correction to the Cerenkov response of doubtful justification and none was applied in this analysis. An energy dependent correction was made using an effective energy calculated from the vertical cut-off for a given event. The maximum value of this correction was about 0.6% in Z for low cut-offs, declining to approximately zero by 10 GV.

G.L.C.

N85-34038*# California Inst. of Tech., Pasadena.

ELEMENTAL ABUNDANCES OF COSMIC RAYS WITH Z < 33 AS MEASURED ON HEAO-3

B. J. Newport, E. C. Stone, C. J. Waddington (Minnesota Univ.), W. R. Binns (Washington Univ., St. Louis, Mo.), T. L. Garrard, M. H. Israel (Washington Univ., St. Louis, Mo.), and J. Klarmann (Washington Univ., St. Louis, Mo.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 123-126 refs (For primary document see N85-34006 22-93)

(Grants NAG8-498; NAG8-500; NAG8-502; NGR-05-002-160; NGR-24-005-050; NGR-26-008-001)

(OG-4.4-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Heavy Nuclei Experiment on (HEAO-3) high energy astronomy observatory 3 uses a combination of ion chambers and a Cerenkov counter. During analysis, each particle is assigned two parameters, Z sub c and Z sub i, proportional to the square roots of the Cerenkov and mean ionization signals respectively. Because the ionization signal is double valued, a unique assignment of particle charge, Z, is not possible in general. Previous work was limited to particles of either high rigidity or low energy, for which a unique charge assignment was possible, although those subsets contain less than 50% of the total number of particles observed. The maximum likelihood technique was used to determine abundances for the complete data set from approx. 1.5 to approx. 80 GeV/amu. G.L.C.

N85-34039*# Washington Univ., St. Louis, Mo. Dept. of Physics.

ABUNDANCES OF SECONDARY ELEMENTS AMONG THE ULTRA HEAVY COSMIC RAYS: RESULTS FROM HEAO-3

J. Klarmann, S. H. Margolis, E. C. Stone (California Inst. of Technology, Pasadena), C. J. Waddington (Minnesota Univ.), W. R. Binns, T. L. Garrard (California Inst. of Technology, Pasadena), M. H. Israel (Minnesota Univ.), and M. P. Kertzman *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 127-130 refs (For primary document see N85-34006 22-93)

(Grants NAG8-448; NAG8-498; NAG8-500; NAG8-502; NGR-05-002-160; NGR-24-005-050; NGR-26-008-001)

(OG-4.4-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Observations of the abundances of elements of charge 62< or Z< or = 73 in the cosmic radiation from the HEAO-3 Heavy Nuclei Experiment (HNE) are discussed. These elements, having solar, and presumably source, abundances much less than the heavier Pt and Pb groups, are expected to be largely products of spallation. Thus they are indicators of the conditions prevailing during the propagation of cosmic rays. The abundances have changed from those reported previously due to a different data selection. This results in better charge resolution and in a higher mean energy for the particles. All the particles included were required to have had a cutoff rigidity R sub c> 5 GV. This allowed the charge determination to be based solely on the Cherenkov measurement. G.L.C.

N85-34040*# California Univ., Berkeley. Dept. of Physics.

CAPABILITIES OF THE LDEF-2 HEAVY NUCLEI COLLECTION

J. Drach, P. B. Price, M. H. Salamon, G. Tarle (Michigan Univ.), and S. P. Ahlen (Indiana Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 131-134 refs (For primary document see N85-34006 22-93)

(OG-4.4-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

To take the next big step beyond High Energy Astronomy Observatory (HEAO-3) the Heavy Nuclei Collector (HNC), to be carried on an LDEF reflight, has the goals of greatly increased collecting power (> 30 actinides) and charge resolution sigma sub Z < or = 0.25 E for Z up to approximately 100, which will provide abundances of all the charges 40 < or Z < or = 96 and permit sensitive searches for hypothetical particles such as monopoles, superheavy elements, and quark nuggets. G.L.C.

N85-34041*# Centre National de la Recherche Scientifique, Paris (France).

ULTRAHEAVY COSMIC RAY TRACKS IN METEORITES: A REAPPRAISAL, BASED ON CALIBRATIONS WITH RELATIVISTIC IONS

Claude Perron *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 135-138 refs (For primary document see N85-34006 22-93)

(OG-4.4-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Experiments were carried out on tracks of high energy U ions in olivine, a common meteoritic mineral. The results offer an explanation for the lack of success of previous attempts to derive the Ultraheavy Cosmic Ray composition from the study of tracks in meteorites. They also suggest how such experiments should be performed. The methods tested are described and illustrated.

Author

N85-34042*# Instituto Nacional de Astrofisica, Opyica y Electronica, Tonantzintla (Mexico).

EXPERIMENTAL TEST FOR INTERPRETING THE INCREASE IN SENSIBILITY OF DOPED CR-39

A. Laville, J. Perez-Peraza (Universidad Nacional Autonoma de Mexico, Mexico City), M. Alvarez (Universidad Nacional Autonoma de Mexico, Mexico City), and M. R. Estrada *In* NASA. Goddard Space light Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 139-141 refs (For primary document see N85-34006 22-93)

(OG-4.4-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

In recent years the sensibility of CR-39 to nuclear tracks has been increased by doping the corresponding monomer with dioctyl phtalate. At this regard, two theoretical approaches are current managed to explain this phenomenon: either the doping react with the active radicals in the chain blocking them, stopping crosslinking between chains, or alternatively that the doping gets between them giving wider space between the crosslinkined chains. G.L.C.

N85-34043*# Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research.

ENERGY SPECTRUM AND ARRIVAL DIRECTION OF PRIMARY COSMIC RAYS OF ENERGY ABOVE 10 TO THE 18TH POWER eV

M. Teshima (Kyoto Univ.), M. Nagano, N. Hayashida, C. X. He (Academia Sinica, Peiking, China), M. Honda, F. Ishikawa, K. Kamata, Y. Matsubara (Kyoto Univ.), M. Mori (Kyoto Univ.), and H. Ohoka *In* NASA. Goddard Space Flight Center 19th Intern.

Cosmic Ray Conf., Vol. 2 Aug. 1985 p 142-145 refs (For primary document see N85-34006 22-93)
(OG-5.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The observation of ultra high energy cosmic rays with 20 sq km array has started at Akeno. The preliminary results on energy spectrum and arrival direction of energies above 10 to the 18th eV are prsented with data accumulated for four years with the 1 sq km array, for two years with the 4 sq km array and for a half year with the new array. The energy spectrum is consistent with the previous experiments showing the flattening above 10 to the 18.5 eV. Author

N85-34044*# Utah Univ., Salt Lake City. Dept. of Physics.
ULTRA HIGH ENERGY COSMIC RAY SPECTRUM
R. M. Baltrusaitis, R. Cady, G. L. Cassiday, R. Cooper, J. W. Elbert, P. R. Gerhardy, P. R. Ko, E. C. Loh, Y. Mizumoto, M. H. Salamon et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 146-149 refs Sponsored in part by NSF (For primary document see N85-34006 22-93)
(OG-5.1-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Ultra-high energy cosmic rays have been observed by means of atmospheric fluorescence with the Fly's Eye since 1981. The differential energy spectrum above 0.1 EeV is well fitted by a power law with slope 2.94 + or - 0.02. Some evidence of flattening of the spectrum is observed or energies greater than 10 EeV, however only one event is observed with energy greater than 50 EeV and a spectral cutoff is indicated above 70 EeV. Author

N85-34045*# Leeds Univ. (England). Dept. of Physics.
THE PRIMARY COSMIC RAY SPECTRUM ABOVE 10 TO THE 19TH POWER eV
G. Brooke, G. Cunningham, P. J. V. Eames, M. A. Lawrence, J. C. Perrett, R. J. O. Reid, and A. A. Watson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 150-153 refs Sponsored in part by Science and Engineering Research Council (For primary document see N85-34006 22-93)
(OG-5.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Progress on a re-evaluation of the spectrum of cosmic rays determined with the Haverah Park shower array is described. Particular attention is paid to the reality of some giant showers. Author

N85-34046*# New Mexico Univ., Albuquerque. Dept. of Physics and Astronomy.
NEW CALORIMETRIC ALL-PARTICLE ENERGY SPECTRUM
John Linsley *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 154-157 refs (For primary document see N85-34006 22-93)
(OG-5.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Both the maximum size N sub m and the sea level muon size N sub mu have been used separately to find the all-particle energy spectrum in the air shower domain. However the conversion required, whether from N sub m to E or from N sub mu to E, has customarily been carried out by means of calculations based on an assumed cascase model. It is shown here that by combining present data on N sub m and N sub mu spectra with data on: (1); the energy spectrum of air shower muons and (2) the average width of the electron profile, one can obtain empirical values of the N sub m to E and N sub mu to E conversion factors, and an empirical calorimetric all-particle spectrum, in the energy range 2 x 10 to the 6th power < E < 2 x 10 to the 9th power GeV. M.G.

N85-34047*# Comitato Nazionale per l'Energia Nucleare, Frascati (Italy).
PRIMARY COSMIC RAY SPECTRUM IN THE 10 TO THE 12TH POWER - 10 TO THE 16TH POWER eV ENERGY RANGE FROM THE NUSEX EXPERIMENT
G. Battistoni, E. Bellotti (Milan Univ.), C. Bloise, G. Bologna (Coonsiglio Nazionale delle Ricerche, Turin), P. Campana, C. Castagnoli (Consiglio Nazionale delle Ricerche, Turin), A. Castellina (Consiglio Nazionale delle Richerche, Turin), V. Chiarella, A. Ciocio, D. Cundy (European Organization for Nuclear Research, Geneva, Switzerland) et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 158-161 refs (For primary document see N85-34006 22-93)
(OG-5.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A primary cosmic ray spectrum was derived which fits both experimental multiple muon rates and the all-nucleon flux derived from the single muon intensities underground. In the frame of the interaction model developed by Gaisser, Elbert and Stanev, it is possible to reproduce NUSEX muon data with a primary composition in which the iron spectrum is only slightly flatter than the proton one. This result rules out the popular idea that the primary composition varies drastically with increasing energy, leading to the dominance of heavier nuclei at energies 10 to the 15th power to 10 to the 16th power eV. M.G.

N85-34048*# Adelaide Univ. (Australia). Dept. of Physics.
A NEW MEASUREMENT OF THE COSMIC RAY ENERGY SPECTRUM BETWEEN 3 X 10 TO THE 15TH POWER eV AND 3 X 10 TO THE 16TH POWER eV
A. G. Gregory, J. R. Patterson, and R. J. Protheroe *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 162-165 refs Sponsored in part by ARGS and Queen Elizabeth II Fellowship and Research Grant (For primary document see N85-34006 22-93)
(OG-5.1-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A new Cerenkov photon density spectrum measurement is reported. The derivation of the primary cosmic ray energy spectrum for energies from 3x10 to the 15th power eV to 3x10 to the 16th power eV are presented. E.A.K.

N85-34049*# Utah Univ., Salt Lake City. Dept. of Physics.
STUDY OF COMPOSITION OF COSMIC RAYS WITH ENERGY .7 < E < 3 Ee
R. M. Baltrusaitis, G. L. Cassiday, R. Cooper, J. W. Elbert, P. R. Gerhardy, E. C. Loh, Y. Mizumoto, P. Sokolsky, O. Steck, T. K. Gaissner (Franklin Inst., Newark, Del.) et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 166-168 cnt Grant NSF PHY-82-01089 refs (For primary document see N85-34006 22-93)
(OG-5.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The longitudinal shower development of extensive air showers (EAS) observed in the fly's eye is used to determine the distribution of X sub max, the depth in the atmosphere of the EAS maximum. Data and Monte Carlo simulations of proton and iron primaries are compared. A substantial contribution from light primaries is noted. E.A.K.

N85-34050*# Nottingham Univ. (England).
THE MUON CONTENT OF EAS AS A FUNCTION OF PRIMARY ENERGY
P. R. Blake, W. F. Nash, M. S. Saich, and A. J. Sephton *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 169-172 refs (For primary document see N85-34006 22-93)
(OG-5.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The muon content of extensive air showers (EAS) was measured over the wide primary energy range 10 to the 16th power to 10 to the 20th power eV. It is reported that the relative muon content of EAS decreases smoothly over the energy range 10 to the 17th power to 10 to the 19th power eV and concluded that the primary cosmic ray flux has a constant mass composition over this range. It is also reported that an apparent significant change in the power index occurs below 10 to the 17th power eV [rho sub c (250 m) sup 0.78]. Such a change indicates a significant

change in primary mass composition in this range. The earlier conclusions concerning EAS of energy > 10 to the 17th power eV are confirmed. Analysis of data in the 10 to the 16th power - 10 to the 17th power eV range revealed a previously overlooked selection bias in the data set. The full analysis of the complete data set in the energy range 10 to the 16th power - 10 to the 17th power ev with the selection bias eliminated is presented. E.A.K.

N85-34051*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE POSSIBILITY OF THE DETERMINING THE AVERAGE MASS COMPOSITION NEAR 10 TO THE 14TH POWER eV THROUGH THE SOLAR MAGNETIC FIELD
J. Lloyd-Evans *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 173-176 refs (For primary document see N85-34006 22-93)
(OG-5.1-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The discovery of primary ultrahigh energy (UHE) gamma-rays has spawned plans for a new generation of air shower experiments with unprecedented directional resolution. Such accuracy permits observation of a cosmic ray shadow due to the solar disc. Particle trajectory simulations through models of the large scale solar magnetic field were performed. The shadow is apparent above 10 to the 15th power eV for all cosmic ray charges /Z/ < 26; at lower energies, trajectories close to the Sun are bent sufficiently for this shadow to be lost. The onset of the shadow is rigidity dependent, and occurs at an energy per nucleus of approx. Z x 10 to the 13th power eV. The possibility of determining the average mass composition near 10 to the 14th power eV from 1 year's observation at a mountain altitude array is investigated. E.A.K.

N85-34052*# Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research.
A NEW METHOD TO DETERMINE THE CHEMICAL COMPOSITION OF THE COSMIC RAYS BEYOND 10 TO THE 15TH POWER eV Abstract Only
Y. Muraki *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 177 (For primary document see N85-34006 22-93)
(OG-5.1-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The chemical composition of primary cosmic rays beyond 10 to the 15th power eV could not be measured by the direct method. A more sensitive method to determine the chemical composition is proposed. The method was checked by simulation and compared with existing data on N sub e-N sub mu and N sub e-N sub gamma. E.A.K.

N85-34053*# Tokyo Univ., Tanashi (Japan).
COSMIC RAY COMPOSITION BETWEEN 10 TO THE 15TH POWER - 10 TO THE 17TH POWER eV OBTAINED BY AIR SHOWER EXPERIMENTS
Y. Muraki *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 178-181 refs (For primary document see N85-34006 22-93)
(OG-5.1-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Based on the air shower data, the chemical composition of the primary cosmic rays in the energy range 10 to the 15th power - 10 to the 17th power eV was obtained. The method is based on a well known N sub e-N sub mu and N sub e-N sub gamma. The simulation is calibrated by the CERN SPS pp collider results. E.A.K.

N85-34054*# Academy of Sciences (USSR), Yakutsk.
FLUCTUATIONS OF DEVELOPMENT MAXIMUM DEPTH AND NUCLEAR COMPOSITION OF PRIMARY COSMIC RADIATION
M. N. Dyakonov, A. A. Ivanov, S. P. Knurenko, D. D. Krasilnikov, V. A. Kolosov, I. Ye. Sleptsov, G. G. Struchkov, and V. N. Pavlov *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 182-185 refs (For primary document see N85-34006 22-93)
(OG-5.1-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The extensive air showers (EAS) cascade curves from the Cerenkov light lateral distribution measurements are recovered and the maximum depth fluctuations of the shower development theta x sub m both on the Cerenkov and charged EAS components are defined. At E sub 0 approximates 10 to the 18th power eV the mean content of protons is greater than 85%, and p-air cross section theta sub 0 p-air < 750mb. E.A.K.

N85-34055*# Academy of Sciences (USSR), Yakutsk.
ESTIMATION OF COMPOSITION OF COSMIC RAYS WITH E SUB ZERO APPROXIMATELY EQUALS 10(17) - 10(18) eV
A. V. Glushkov, N. N. Efimov, N. N. Efremov, I. T. Makarov, M. I. Pravdin, and L. I. Dedenko (Moscow State Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 186-189 refs (For primary document see N85-34006 22-93)
(OG-5.1-14) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Fluctuations of the shower maximum depth obtained from analysis of electron and muon fluctuations and the extensive air showers (EAS) Cerenkov light on the Yakutsk array data and data of other arrays are considered. On the basis of these the estimation of composition of primaries with E sub 0 = 5.10 to the 17th power eV is received. Estimation of gamma-quanta flux with E sub 0 > 10 to the 17th power eV is given on the poor-muon showers. E.A.K.

N85-34056*# Academy of Sciences (USSR), Yakutsk.
ALL PARTICLE ENERGY SPECTRUM OF COSMIC RAYS IN 10 TO THE 15TH POWER - 10 TO THE 20TH POWER eV REGION
D. D. Krasilnikov, M. N. Dyakonov, A. A. Ivanov, V. A. Kolosov, F. F. Lischenyuk, and I. Ye. Sleptsov *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 190-193 refs (For primary document see N85-34006 22-93)
(OG-5.1-15) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Average estimations of the shower energy components are presented and their sum gives E sub 0 (Rho sub 600) - an average function of the relation of E sub 0 with the shower size parameter Rho sub 600 measured at the Yakutsk extensive air showers (EAS) array. Using this relation to the EAS spectrum obtained at the Akeno and Yakutsk arrays the energy spectrum of the cosmic ray total flux within 15 < lg (E sub 0,[eV]) < 20 by the EAS methods is recovered. Author

N85-34057*# Academy of Sciences (USSR), Yakutsk.
EAS SPECTRUM IN THE PRIMARY ENERGY REGION ABOVE 10 TO THE 15TH POWER eV BY THE AKENO AND YAKUTSK ARRAY DATA
D. D. Krasilnikov, S. P. Knurenko, A. D. Krasilnikov, V. N. Pavlov, I. Ye. Sleptsov, and V. P. Yegorova *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 194-197 refs (For primary document see N85-34006 22-93)
(OG-5.1-16) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The extensive air showers spectrum on scintillation desity Rko in primary energy region E sub approx. 10 to the 15th power - 10 to the 20th power eV on the Yakutsk array data and recent results of the Akeno is given. E.A.K.

N85-34058*# Academy of Sciences (USSR), Yakutsk.
COSMIC RAY SPECTRA MEASUREMENTS AT THE YAKUTSK EAS ARRAY
A. V. Glushkov, T. A. Egorov, N. N. Efimov, M. I. Pravdin, and G. B. Khristiansen (Scientific-Research Inst. of Nuclear Physic, Moscow, USSR) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 198-200 refs (For primary document see N85-34006 22-93)
(OG-5.1-17) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The extensive air showers (EAS) spectra on rho 600 obtained at the Yakutak array for 38000 operation hours in 1974 to 1982 are presented. The refined value of the conversion factor from rho 600 to E sub is given and based on it the primary energy spectrum is obtained. The Yakutsk EAS array classifies the showers on parameters which are well measured in real showers: in the central part - on Rho sub 300 and on the whole array - on Rho sub 600. The shower spectra are constructed first on these parameters, than - a single spectrum on Rho sub 600. The Rho sub 300 and Rho sub 600 values are determined on the particle lateral distribution function (LDF) obtained in Yakutsk and on approximation Rho approx. R sup/n using the experimental points closest to R* (300 and 600 m). E.A.K.

N85-34059*# Maryland Univ., College Park.
COMPOSITION OF PRIMARY COSMIC RAYS NEAR THE BEND FROM A STUDY OF HADRONS IN AIR SHOWERS AT SEA LEVEL
A. I. Mincer, H. T. Freudenreich, J. A. Goodman, S. C. Tonwar, G. B. Yodh, R. W. Ellsworth (George Mason Univ.), and D. Berley (NSF) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 201-204 refs (For primary document see N85-34006 22-93)
(OG-5.2-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data on hadrons in air showers arriving at sea level were studied to find sensitivity to primary cosmic ray composition. The rate of showers which satisfy minimum shower density and hadron energy requirements as well as the rate of showers containing hadrons delayed with respect to the electron shower front are compared to Monte Carlo simulations. The data on the rate of total triggers and delayed hadrons are compared to predicted rates for two models of primary composition. The data are consistent with models which require an increasing heavy nuclei fraction near 10 to the 15th power eV. The spectra which are consistent with the observed rate are also compared to the observed shower size spectrum at sea level and mountain level. E.A.K.

N85-34060*# Maryland Univ., College Park.
THE COMPOSITION OF COSMIC RAYS NEAR THE BEND (10 TO THE 15TH POWER eV) FROM A STUDY OF MUONS IN AIR SHOWERS AT SEA LEVEL Abstract Only
J. A. Goodman, S. C. Gupta, H. Freudenreich, K. Sivaprasad, S. C. Tonwar (Tata Inst. of Fundamental Research), G. B. Yodh, R. W. Ellsworth (George Mason Univ.), M. C. Goodman (ANL), M. C. Bogert (Fermi National Lab.), R. Burnstein (Illinois Inst. of Tech.) et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 205 (For primary document see N85-34006 22-93)
(OG-5.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The distribution of muons near shower cores was studied at sea level at Fermilab using the E594 neutrino detector to sample the muon with E testing 3 GeV. These data are compared with detailed Monte Carlo simulations to derive conclusions about the composition of cosmic rays near the bend in the all particle spectrum. Monte Carlo simulations generating extensive air showers (EAS) with primary energy in excess of 50 TeV are described. Each shower record contains details of the electron lateral distribution and the muon and hadron lateral distributions as a function of energy, at the observation level of 100g/cm. The number of detected electrons and muons in each case was determined by a Poisson fluctuation of the number incident. The resultant predicted distribution of muons, electrons, the rate events are compared to those observed. Preliminary results on the rate favor a heavy primary dominated cosmic ray spectrum in energy range 50 to 1000 TeV. E.A.K.

N85-34061*# Hirosaki Univ. (Japan).
COMPOSITION OF PRIMARY COSMIC RAYS AT ENERGIES 10(15) TO APPROXIMATELY 10(16) eV
M. Amenomori, E. Konishi, N. Hotta, K. Mizutani (Utsunomiya Univ., Japan), K. Kasahara (Saitama Univ., Japan), T. Kobayashi (Tokyo Univ., Tanashi, Japan), E. Mikumo (Tokyo Univ., Tanashi, Japan), K. Sato (Tokyo Univ., Tanashi, Japan), T. Yuda (Tokyo Univ., Tanashi, Japan), and I. Mito (Tokyo Univ., Tanashi, Japan) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 206-209 refs (For primary document see N85-34006 22-93)
(OG-5.2-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The sigma epsilon gamma spectrum in 1 approx. 5 x 1000 TV observed at Mt. Fuji suggests that the flux of primary protons 10 to the 15 approx 10th eV is lower by a factor of 2 approx. 3 than a simple extrapolation from lower energies; the integral proton spectrum tends to be steeper than around to the power V and the spectral index tends to be steeper than Epsilon to the -17th power around 10 to the 14th power eV and the spectral index becomes approx. 2.0 around 10 to the 15th power eV. If the total flux of primary particles has no steepening up to approx 10 to the 15th power eV, than the fraction of primary protons to the total flux should be approx 20% in contrast to approx 45% at lower energies. E.A.K.

N85-34062*# Bulgarian Academy of Science, Sofia.
EAS FLUCTUATION APPROACH TO PRIMARY MASS COMPOSITION INVESTIGATION
J. N. Stamenov and V. D. Janminchev (High Pedagogical School, Shoumen, Bulgaria) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Conf., Vol. 2 Aug. 1985 p 210-213 refs (For primary document see N85-34006 22-93)
(OG-5.2-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The analysis of muon and electron fluctuation distribution shapes by statistical method of invers problem solution gives the possibility to obtain the relative contribution values of the five main primary nuclei groups. The method is model-independent for a big class of interaction models and can give good results for observation levels not too far from the development maximum and for the selection of showers with fixed sizes and zenith angles not bigger than 30 deg. E.A.K.

N85-34063*# Bern Univ. (Switzerland). Physkalisches Inst.
THE PRIMARY COMPOSITION BEYOND 10 TO THE 5TH POWER GeV AS DEDUCED FROM HIGH ENERGY HADRONS AND MUONS IN AIR SHOWERS
Peter K. F. Grieder *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 214-217 refs Sponsored in part by Swiss National Science Foundation (For primary document see N85-34006 22-93)
(OG-5.2-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Data obtained from a large set of air shower simulation calculations with use of highly refined hadronic interaction and shower simulation model are presented, in an attempt to solve the problem of primary chemical composition beyond 100,000 GeV total energy. It is rated that high energy hadrons in air showers offer a rather unique primary mass signature and show that the interpretation of high energy muon data is much more ambiguous. Predictions are compared with experimental data. E.A.K.

N85-34064*# Bulgarian Academy of Science, Sofia. Inst. of Nuclear Research and Nuclear Energy.
IMPLICATION OF EAS DATA FOR THE STUDY OF PRIMARY COSMIC RAYS ABOVE 10 TO THE 5TH POWER GeV
L. Popova and J. Wdowczyk (Inst. of Nuclear Problems, Lodz, Poland) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray. Conf., Vol. 2 Aug. 1985 p 218-221 refs (For primary document see N85-34006 22-93)
(OG-5.2-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Due to the strong decrease of the energetic cosmic ray flux its direct detection at the top of atmosphere with aircraft is limited at the present time to about 100,000 GeV. The intensity of all primary particles can be approximated in the range 100 to 100,000 GeV by power function with power index 2.65. There are predomin-

antly protons and the rest is represented by several groups of nuclei. In the range of 100,000 to 10 to the 8th power GeV considerable disagreement is most probably connected with the uncertainity of the indirect derivation of the parameters of extensive air showers. Results for the primary spectrum in the range to the 8th power GeV, obtained by implication of extensive air showers (EAS) data from mountain altitudes are discussed. E.A.K.

N85-34065*# Saitama Univ., Urawa (Japan). Dept. of Physics.
HIGH-ENERGY MULTIPLE MUONS AND HEAVY PRIMARY COSMIC-RAYS
K. Mizutani, T. Sato (Osaka City Univ.), T. Takahashi (Osaka City Univ.), and S. Higashi (Osaka City Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 222-225 refs (For primary document see N85-34006 22-93)
(OG-5.2.9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Three-dimensional simulations were carried out on high-energy multiple muons. On the lateral spread, the comparison with the deep underground observations indicates that the primary cosmic rays include heavy nuclei of high content. A method to determine the average mass number of primary particles in the energy around 10 to the 15th power eV is suggested. E.A.K.

N85-34066*# Tata Inst. of Fundamental Research, Bombay (India).
COMPOSITION OF PRIMARY COSMIC RAYS NEAR THE KNEE
B. S. Acharya, M. V. S. Rao, K. Sivaprasad, and B. V. Sreekantan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 226-229 refs (For primary document see N85-34006 22-93)
(OG-5.2-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The size dependence of high energy muons and the size spectrum obtained in the air shower experiment suggest that the mean mass of cosmic rays remains nearly constant at approx 15 up to 5 x 1000,000 GeV and becomes one beyond. The composition model in which nuclei are removed spectrum steepens at 6.7 x 10 power GeV due to leakage from the galaxy, which explains the data which are consistent with data from other experiments. E.A.K.

N85-34067*# Adelaide Univ. (Australia). Dept. of Physics.
EAS CERENKOV MEASUREMENTS OF THE COMPOSITION OF THE COSMIC RAY FLUX AROUND 10 TO THE 16TH POWER eV
B. R. Dawson, J. R. Prescott, and R. W. Clay *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 230-233 refs Sponsored in part by Australian Research Grants Scheme (For primary document see N85-34006 22-93)
(OG-5.2-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Information can be obtained about the nature of a primary cosmic ray by looking at the way in which an extensive air shower (EAS) develops in the atmosphere. Heavy nuclei give rise to showers that develop high in the atmosphere and the depth of maximum development is subjected to much smaller fluctuations than is the case for showers originating from protons. This development is followed by optical methods based on the observations of Cerenkov light or fluorescence light. The Cerenkov observations have two complementary techniques: measurement of the time profile of the Cerenkov pulse with resolution of a few nanoseconds and measurement of the lateral distribution of the Cerenkov light. In each case the measured quantities must be related to some characteristic development parameters. E.A.K.

N85-34068*# Hong Kong Univ. Dept. of Physics.
ELECTRON AND MUON PARAMETERS OF EAS AND THE COMPOSITION OF PRIMARY COSMIC RAYS IN 10(15) TO APPROXIMATELY 10(16) eV
T. Cheung and P. K. MacKeown *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 234-237 refs (For primary document see N85-34006 22-93)
(OG-5.2-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Estimation of the relative intensities of protons and heavy nuclei in primary cosmic rays in the energy region 10 to the 15th power approx. 10 to the 17th power eV, was done by a systematic comparison between all available observed data on various parameters of extensive air showers (EAS) and the results of simulation. The interaction model used is an extrapolation of scaling violation indicated by recent pp collider results. A composition consisting of various percentages of Fe in an otherwise pure proton beam was assumed. Greatest overall consistency between the data and the simulation is found when the Fe fraction is in the region of 25%. E.A.K.

N85-34069*# Okayama Univ. (Japan). Dept. of Physics.
ARRIVAL DIRECTIONS OF LARGE AIR SHOWERS, LOW-MU SHOWERS AND OLD-AGE LOW-MU AIR SHOWERS OBSERVED AT ST. CHACALTAYA
T. Kaneko, K. Hagiwara (Inst. of Physical and Chemical Research), H. Yoshii (Ehime Univ.), N. Martinic (Univ. Mayor de San Andres), L. Siles (Univ. Mayor de San Andres), P. Miranda (Univ. Mayor de San Andres), F. Kakimoto (Tokyo Inst. of Technology), T. Obara (Tokyo Inst. of Technology), N. Inoue (Tokyo Inst. of Technology), and K. Suga (Tokyo Inst. of Technology) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 238-241 refs (For primary document see N85-34006 22-93)
(OG-5.3-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Arrival directions of air showers with primary energies in the range 10 to the 16.5 power eV to 10 to the 18th power eV show the first harmonic in right ascension (RA) with amplitude of 2.7 + or - 1.0% and phase of 13-16h. However, the second harmonic in RA slightly seen for showers in the range 10 to the 18th power eV to 10 to the 19th power eV disappeared by accumulation of observed showers. The distribution of arrival directions of low-mu air showers with primary energies around 10 to the 15th power eV observed at Chacaltaya from 1962 to 1967 is referred to, relating to the above-mentioned first harmonic. Also presented in this paper are arrival directions of old-age low-mu air showers observed at Chacaltaya from 1962 to 1967, for recent interest in gamma-ray air showers. Author

N85-34070*# Tokyo Univ., Tanashi (Japan). Inst. for Cosmic Ray Research.
ANISOTROPY OF COSMIC RAYS OF ENERGY 10 (15) eV TO 10 (17) eV OBSERVED AT AKENO
T. Kifune, K. Nishijima (Kobe Univ.), T. Hara, Y. Hatano, N. Hayashida, M. Honda, K. Kamata, Y. Matsubara (Kyoto Univ.), M. Nagano, G. Tanahashi et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 242-245 refs (For primary document see N85-34006 22-93)
(OG-5.3-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Anisotropy of cosmic rays is studied with extensive air showers (EAS) data by muon trigger. The present results support those obtained by electron trigger which suggest the significant anisotropy of second harmonics with phase around 100 deg in right ascension for showers of 10 to the 16th power - 10 to the 17th power eV, and predominant arrival direction of 230 deg in right ascension for muon-rich showers. It seems that the phase of the first harmonics in the energy range below 10 to the 11th power eV is about 300 deg in right ascension and the second harmonics near 6 x 10 to the 14th power eV is statistically significant with an amplitude of 0.39 + or - 0.13% in direction of 83 + or - 10 deg in right ascension. Author

N85-34071*# Utah Univ., Salt Lake City. Dept. of Physics.
ARRIVAL DIRECTIONS OF COSMIC RAYS OF E < .4 EeV
R. M. Baltrusaitis, R. Cady, G. I. Cassiday, R. Cooper, J. W. Elbert, P. R. Gerhardy, S. Ko, E. C. Loh, Y. Mizumoto, M. H. Salamon et al *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 246-249 refs (For primary document see N85-34006 22-93)
(Grant NSF PHY-82-01089)

(OG-5.3-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The anisotropy of cosmic rays observed by the Utah Fly's Eye detector has been studied. Emphasis has been placed on examining distributions of events in galactic coordinates. No statistically significant departure from isotropy has been observed for energies greater than 0.4 EeV (1 EeV = 10 to the 18th power eV). Results of the standard harmonic analysis in right ascension are also presented. Author

N85-34072*# Nagoya Univ. (Japan). Cosmic Ray Research lab.

THE SIDEREAL ANISOTROPY OF COSMIC RAYS AROUND 3 X 10 (15) eV OBSERVED AT A MIDDLE NORTH LATITUDE

K. Murakami, T. Kifune (Tokyo Univ.), and N. Hayashida (Tokyo Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 250-253 refs (For primary document see N85-34006 22-93)

(OG-5.3-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The sidereal time variation of cosmic rays (median primary energy : 3 10 to the 15th power eV) is investigated with air shower observations at Akeno, Japan (900 m a.s.l.) which started in September 1981. Air showers are detected by a coincidence requirement on several muon detectors. The result obtained for three years is suggestive of a big semi-diurnal variation (0.37 % in amplitude). On the other hand, the diurnal variation is rather small than the semi-diurnal one. The feature of the sidereal anisotropy supposed from the present result looks quite different from that below 10 to the 14th power eV. Author

N85-34073*# Leeds Univ. (England). Dept. of Physics.

ARRIVAL DIRECTION DISTRIBUTION OF COSMIC RAYS OF ENERGY < 10 (18) eV

P. V. J. Eames, J. Lloyd-Evans, C. Morello, R. J. O. Reid, and A. A. Watson *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 254-257 refs Sponsored in part by NATO and SERC (For primary document see N85-34006 22-93)

(OG-5.3-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Haverah Park air-shower experiment recorded over 8500 events with primary energy > 10 to the 18th power eV between 1963 and 1983. An analysis of these events for anisotropies in celestial and galactic coordinates is reported. No very striking anisotropies are observed. Author

N85-34074*# Zhengzhou Univ. (China). Dept. of Physics.

OBSERVATION OF ARRIVAL TIMES OF EAS WITH ENERGIES < OR = 6 X 10 (14) eV

Luorui Sun *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 258-261 refs (For primary document see N85-34006 22-93)

(OG-5.3-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Earth's atmosphere is continually being bombarded by primary cosmic ray particles which are generally believed to be high-energy nuclei. The fact that the majority of cosmic ray primaries are charged particles and that space is permeated with random magnetic fields, means that the particles do not travel in straight lines. The arrival time distribution of EAS may also transfer some information about the primary particles. Actually, if the particles come to our Earth in a completely random process, the arrival time distribution of pairs of successive particles should fit an exponential law. The work reported here was arried out at Sydney University from May 1982 to January 1983. All the data are used to plot the arrival-time distribution of the events, that is, the distribution of time-separation between consecutive events on a 1 minute bin size. During this period more than 2300 showers were recorded. The results are discussed and compared with that of some other experiments. B.W.

N85-34075*# Hong Kong Univ. Dept. of Physics.

COSMIC RAY INTENSITY VARIATIONS AT PRIMARY RIGIDITIES NEAR 1900 GV

Y. W. Lee, P. K. MacKeown, and L. K. Ng *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 262-265 refs (For primary document see N85-34006 22-93)

(OG-5.3-0) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Preliminary analysis of an experiment monitoring cosmic ray muons yields a first sidereal harmonic amplitude for rigidities around 1900 GV of (7.95 + or - 3.97) 10 to the 0.001 power at 5.1 + or - 1.9h right ascention. A significant anti-sidereal first harmonic is, however, also seen. Author

N85-34076*# Adelaide Univ. (Australia). Dept. of Physics.

SEARCH FOR BURSTS IN AIR SHOWER DATA

T. E. G. Bruce, R. W. Clay, B. R. Dawson, R. J. Protheroe, D. G. Blair (Univ. of Western Australia), and P. Cinquini *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 266-269 refs (For primary document see N85-34006 22-93)

(OG-5.3-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

There have been reports in recent years of the possible observation of bursts in air shower data. If such events are truly of an astrophysical nature then, they represent an important new class of phemonenon since no other bursts have been observed above the MeV level. The spectra of conventional gamma ray bursts are unknown at higher energies but their observed spectra at MeV energies appear generally to exhibit a steepening in the higher MeV range and are thus unlikely to extrapolate to measurable fluxes at air shower energies. An attempt has been made to look for deviations from randomness in the arrival times of air showers above approx. 10 to the 14th power eV with a number of systems and results so far are presented here. This work will be continued for a substantial period of ime with a system capable of recording bursts with multiple events down to a spacing of 4 microns. Earlier data have also been searched for the possible association of air shower events with a glitch of the Vela pulsar. B.W.

N85-34077*# Adelaide Univ. (Australia). Dept. of Physics.

AIR SHOWER ARRIVAL DIRECTIONS MEASURED AT BUCKLAND PARK

P. R. Gerhardy (Utah Univ., Salt Lake City), R. W. Clay, J. R. Patterson, J. R. Prescott, A. G. Gregory, and R. J. Protheroe *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 270-271 refs (For primary document see N85-34006 22-93)

(OG-5.3-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The Buckland Park air shower array was operated for 3 years from 1979 to 1981 particularly for the study of anisotropies in the region of the knee of the size spectrum. The array which has been described in detail elsewhere was situated at a latitude of 35 S and had an effective size threshold of approx 3 x 10 to the 5th power particles (approx 3 x 10 to the 15th power Ev for vertical showers). A number of results from this experiment have already been published including anisotropy analyses (Gerhardy and Clay, 1983) and searches for very high energy gamma ray sources. The final distribution of measured shower arrival directions are presented here. These 1.3 x 10 to the 5th power events were selected as indicated in detail in Gerhardy and Clay (1983) and were essentially those events with well measured arrival directions. They are the same data set used in the above reference but no complete sky map has previously been presented. B.W.

N85-34078*# Tokyo Univ. (Japan). Inst. for Cosmic Ray Research.

A SIMULATION OF HIGH ENERGY COSMIC RAY PROPAGATION 1

M. Honda, T. Kifune, Y. Matsubara (Kyoto Univ.), M. Mori (Kobe Univ.), K. Nishijima, and M. Teshima (Kyoto Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 272-275 refs (For primary document see

N85-34006 22-93)
(OG-5.4-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

High energy cosmic ray propagation of the energy region 10 to the 14.5 power - 10 to the 18th power eV is simulated in the inter steller circumstances. In conclusion, the diffusion process by turbulent magnetic fields is classified into several regions by ratio of the gyro-radius and the scale of turbulence. When the ratio becomes larger then 10 to the minus 0.5 power, the analysis with the assumption of point scattering can be applied with the mean free path E sup 2. However, when the ratio is smaller than 10 to the minus 0.5 power, we need a more complicated analysis or simulation. Assuming the turbulence scale of magnetic fields of the Galaxy is 10-30pc and the mean magnetic field strength is 3 micro gauss, the energy of cosmic ray with that gyro-radius is about 10 to the 16.5 power eV. B.W.

N85-34079*# Tokyo Univ. (Japan). Inst. for Cosmic Ray Research.
A SIMULATION OF HIGH ENERGY COSMIC RAY PROPAGATION 2
M. Honda, K. Kamata, T. Kifune, Y. Matsubara (Kyoto Univ.), M. Mori (Kyoto Univ.), and K. Nishijima (Kobe Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 276-279 refs (For primary document see N85-34006 22-93)
(OG-5.4-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The cosmic ray propagation in the Galactic arm is simulated. The Galactic magnetic fields are known to go along with so called Galactic arms as a main structure with turbulences of the scale about 30pc. The distribution of cosmic ray in Galactic arm is studied. The escape time and the possible anisotropies caused by the arm structure are discussed. Author

N85-34080*# Maryland Univ., College Park. Astronomy Program.
COSMIC RAYS IN THE 10(16) TO 10(19) eV RANGE FROM PULSARS
Amri Wandel and Donald C. Ellison *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 280-283 refs (For primary document see N85-34006 22-93)
(OG-5.4-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The flux is calculated of cosmic rays (CRs) produced by a distribution of pulsars that are: (1) born with rapid rotation rates, (2) slow down as they evolve, and (3) produce energetic nuclei with a characteristic energy proportional to their rotation rates. It is found that, for energy independent escape from the disk of the galaxy, the predicted spectrum will be essentially what is observed between approx 10 to the 16th power to 10 to the 19 power eV if the slow down law as inferred for radio pulsars can be extrapolated to young pulsars with shorter periods. B.W.

N85-34081*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGY DEPENDENCE OF COSMIC RAY COMPOSITION ABOVE 10(15) GeV/NUCLEUS
John Linsley (New Mexico Univ., Albuquerque) and Carl E. Fichtel *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 284-287 refs (For primary document see N85-34006 22-93)
(OG-5.4-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It is argued that above 10 to the 5th power GeV/nucleus, in the range where charge-resolved spectra have not yet been determined, the appropriate measures of equal-energy composition are $< 1nA >$ and [1nA], the mean value and dispersion relative to the mean value and dispersion relative to the mean of 1nA, where A is the mass number. Experimental data which are sensitive to changes in $< 1nA >$ with increasing energy are examined. It is found that, taken as a whole, they show no change (+ or 0.5) between 10 to the 5th power and 10 to the 6th power GeV, and a decrease of 1.5 + or - 0.5 between 10 to the 6th power and 10 to the 8th power GeV, with no further change + or - 0.5) above 10 to the 8th power GeV. Taken as a whole, the various indirect estimates of the absolute value of $< 1nA >$ above 10 to the 5th power GeV/nucleus are also consistent with this pattern. For a wide range of astrophysically plausible composition models the value of the other measure, [1nA] is insensitive to changes in $< 1nA >$. Because of this the existing data on [1nA] can likewise easily be reconciled with this pattern. Author

N85-34082*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPLICATIONS OF THE EXPERIMENTAL RESULTS ON HIGH ENERGY COSMIC RAYS WITH REGARD TO THEIR ORIGIN
Carl E. Fichtel and John Linsley (New Mexico Univ., Albuquerque) *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 288-291 refs (For primary document see N85-34006 22-93)
(OG-5.4-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It was shown in an earlier report that current cosmic ray evidence supports a change in the cosmic ray composition in the region between 10 to the 6th power and 10 to the 8th power GeV total energy in the direction of a smaller average value of A. Compared to normal celestial abundances, the heavy nuclei are much less abundant, and, in fact, the composition measurements above 10 to the 8th power GeV are consistent with there being only protons. Here, these results combined with those of the energy spectrum and anisotropy of the comsic rays and other astrophysical information will be examined to try to determine their implications for the origin of the cosmic rays. In this paper, consideration is given to the implications of one or more than one type of source in the galaxy to see which are consistent with the interpretation of current measurements. The nature of the source types that would be required are discussed. B.W.

N85-34083*# Lodz Univ. (Poland). Inst. of Nuclear Science and Technology.
THE PRIMARY COSMIC RAY MASS COMPOSITION AT ENERGIES ABOVE 10(14) eV
J. Gawin, J. Wdowczyk, and J. Kempa *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 292-295 refs (For primary document see N85-34006 22-93)
(OG-5.4-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It is shown in this paper that the experimental data on extensive air showers at the energy interval 10 to the 15th power - 10 to the 17th power eV seems to be described best if it is assumed that the Galactic cosmic rays are described by some sort of a two component picture. The first component is of a mixed composition similar to that at lower energies and the second is dominated by protons. Overall spectrum starts to be enriched in protons at energies about 10 to the 15th power eV bu the effective mass of the primaries remains constant up to energies around 10 to the 16th power eV. That results from the fact that composition gradually changes from multi-component to mixture of protons and heavies. That picture receives also some sort of support from recent observations of relatively high number of nergetic protons in JACEE and Concorde experiments. B.W.

N85-34084*# Leeds Univ. (England). Dept. of Physics.
UHE PARTICLE PRODUCTION IN CLOSE BINARY SYSTEMS
A. M. Hillas *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 296-299 refs (For primary document see N85-34006 22-93)
(OG-5.4-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Cygnus X-3 appears to generate so much power in the form of charged particles of up to approx 10 to the 17th power eV that the galaxy may need approx < 1 such source on average to maintain its flux of ultra high energy cosmic rays. Accreting gas must supply the energy, and in a surprisingly ordered form, if it is correct to use a Vest-rand-Eichler model for radiation of gammas, modified by the introduction of an accretion wake. Certain relationships between 10 to the 12th power eV and 10 to the 15th power gamma rays are expected. Author

N85-34085*# Lodz Univ. (Poland). Inst. of Physics.
VIRGO CLUSTER AS A HIGH ENERGY COSMIC RAYS SOURCE
S. Karakula and W. Tkaczyk *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 300-303 refs (For primary document see N85-34006 22-93)
(OG-5.4.8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The extragalactic charged particles are reflecting from the Galaxy by its magnetic field. Assuming magnetic field in the Galaxy as quasilongitudinal, the mean transparency of Galaxy has been evaluated for extragalactic protons defined as a fraction of particles at a given energy from a given direction passing by the galactic plane. The anisotropy caused by the Galactic magnetic field reflection of protons can explain observed arrival directions of extensive air showers at large angle to the galactic plane. Our analysis shows that the increase with energy observed in < sin b sup 11 > is self-consistent with changing in the cosmic ray energy spectrum at high energy (E 10 to the 19th power eV) in the case when extragalactic cosmic ray source with spectral index -2.2 is at the position of the Virgo Cluster. Author

N85-34086*# Utah Univ., Salt Lake City. Dept. of Physics.
MODELING COSMIC RAY ANISOTROPIES NEAR 10(18) eV
P. Sommers and J. W. Elbert *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 304-307 refs (For primary document see N85-34006 22-93)
(Grant NSF PHY-84-15294)
(OG-5.4-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A galactic magnetic field reversal near the Sagittarius spiral arm may be responsible for the southern excess (or northern shortage) of cosmic rays near 10 to the 18th power eV. The north-south asymmetry produced by such a reversal would increase with energy in the same manner as the observed asymmetry. The existence of a reversal has been inferred from analyses of Faraday rotation measures. Author

N85-34087*# Adelaide Univ. (Australia). Dept. of Physics.
ANISOTROPY AND THE KNEE OF THE ENERGY SPECTRUM
R. W. Clay *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 308-310 refs (For primary document see N85-34006 22-93)
(OG-5.4-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The measured cosmic ray energy spectrum exhibits clear structure (the knee) at approx 3 x 10 to the 15th power eV (sea level shower size approx 3 x 10 to the 5th power particles). Additionally, at energies in this general region, there occur apparent changes in shower development such that the observed characteristics of showers at this energy appear different to those characteristics observed at somewhat higher energies. At energies just below this region, the cosmic ray anisotropy amplitude apparently begins a progressive increase with energy. The latter effect does not clearly fit with the first two since there appears to be no significant change exactly at the knee. However, the phase of the first harmonic of the anisotropy appears to show a substantial change just where the energy spectrum shows structure and in the middle of the shower development changes. The first harmonic phase appears to change from approx. 18 hours R.A. to approx. 5 hours R.A. as the energy of observation moves through the knee. In this paper the latter change is examined in some detail by taking into account information contained in the second harmonic of the anisotropy. B.W.

N85-34088*# Lodz Univ. (Poland). Inst. of Nuclear Studies.
ANISOTROPY OF COSMIC RAYS ABOVE 10(14) eV
J. Wdowczyk and A. W. Wolfendale (Durham Univ.) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 311-313 refs (For primary document see N85-34006 22-93)
(OG-5.4-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A survey is made of the anisotropy of cosmic rays at energies above 10 to the 14th power eV. It is concluded that cosmic gamma-rays may have an effect in the range 10 to the 14 power - 10 to the 16th power eV, above which protons dominate. Evidence is presented for an excess in the general direction of the Galactic plane which grows with increasing energy until about 10 to the 19th power eV, indicating a Galactic origin for these particles. At higher energies an Extragalactic origin is indicated. Author

N85-34089*# Academia Sinica, Beijing (China). Inst. of High Energy Physics.
A MODEL FOR THE PROTON SPECTRUM AND COSMIC RAY ANISOTROPY
Chunxian Xu *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 314-317 refs (For primary document see N85-34006 22-93)
(OG-5.4-12) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The problem of the origin of the cosmic rays is still uncertain. As a theory, it should explain the support of particles and energy, the mechanism of acceleration and propagation as well as some important features obtained directly from cosmic ray experiments, such as the power spectrum and the knee. There are two kinds of models for interpreting the knee of the cosmic ray spectrum. One is the leaky box model. Another model suggests that the cut-off rigidity of the main sources causes the knee. The present paper studies the spectrum and the anisotropy of cosmic rays in an isotropic diffuse model with explosive discrete sources in an infinite galaxy. B.W.

N85-34090*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
INTERPRETATION OF COSMIC-RAY ANISOTROPY BELOW 10(14) eV
L. C. Tan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 318-321 refs (For primary document see N85-34006 22-93)
(OG-5.4-13) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It is found that the measured data on the degree of anisotropy of cosmic rays are consistent with our proposed nonuniform galactic disk model. Moreover, it is pointed out that the abrupt increase of the anisotropy of cosmic rays beyond 10 to the 14th power eV should imply a change of their mass composition. Author

N85-34091*# Academy of Sciences (USSR), Yakutsk. Inst. of Cosmophysical Research and Aeronomy.
ON GALACTIC ORIGIN OF COSMIC RAYS WITH ENERGY UP TO 10(19) eV
N. N. Efimov and A. A. Mikhailov *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 322-325 refs (For primary document see N85-34006 22-93)
(OG-5.4-15) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The experimental data on ultrahigh energy cosmic ray anisotropy are considered. In supposed models of galactic magnetic field the main characteristics of expected anisotropy are estimated and are compared with the experimental data. It is shown that particles with energy up to 10 to the 19th power eV are of galactic origin. Author

N85-34092*# Tata Inst. of Fundamental Research, Bombay (India).
ABUNDANCE OF LOW ENERGY (50-150 MeV) ANTIPROTONS IN COSMIC RAYS
K. M. V. Apparao, S. Biswas, N. Durgaprasad, and S. A. Stephens *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 326-329 refs (For primary document see N85-34006 22-93)
(OG-6.1-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The progress is presented of the nuclear emulsion experiment to determine abundance of low energy antiprotons in cosmic rays. No antiprotons have been detected so far at upper limit of p/p less than or similar to 4 x .0001 in the energy range 50 MeV to 15 MeV. Author

N85-34093*# Danish Space Research Inst., Lyngby.
SEARCH FOR HEAVY ANTINUCLEI IN THE COSMIC RADIATION
Niels Lund and Miriam Rotenberg *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 330-333 refs (For primary document see N85-34006 22-93)
(OG-6.1-2) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The existence of significant amounts of antimatter in the Universe is demonstrated through cosmic radiation. The data from the Danish-French Cosmic Ray Spectrometer on the HEAO-3 satellite offers an opportunity to search for heavy antinuclei, since all the relevant parameters (charge, velocity, arrival direction, and satellite position at the time of arrival) are measured for each recorded nucleus. Using the 22676 positive only events in the data seletion corresponding to $L < 1.5$ as a measure of our exposure factor to heavy antinuclei and noting that no corresponding antinuclei were found, an upper limit (95% confidence) is given to the ratio of antinuclei to nuclei as 1.4 x .0001 for particles with Z 9. The upper limit resulting from this work is compared with previous results of searches for heavy antimatter in the cosmic radiation. It is seen that, if one regards only antiparticles heavier than fluorine, then the present result represents a reduced upper limit over previous data. When taken together, all the available experiment data now push the upper limit for the ratio of antiparticles to particles well below .0001. Author

N85-34094*# Arizona Univ., Tucson. Dept. of Physics.
PROPAGATION AND SECONDARY PRODUCTION OF LOW ENERGY ANTIPROTONS IN THE ATMOSPHERE
T. Bowen and A. Moats *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 334-337 refs (For primary document see N85-34006 22-93)
(Grant NSF PHY-82-07697)
(OG-6.1-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Current theories, in which the observed antiproton component is attributed strictly to secondary production in high energy inelastic collisions of protons with the interstellar medium or the atmosphere, apparently fail to explain the relatively high p vertical intensities measured at mountain and balloon altitudes. Therefore, a more careful calculation of the theoretical secondary intensity spectra is required before more exotic sources for these excess p's can be explored. A one dimensional diffusion equation is used to calculate the expected vertical intensity of p's due only to secondary production in the atmosphere; any assumed primary p spectrum is also included. Two adjustable parameters, the inelasticity and charge exchange in nucleon-nucleus collisions, were included in the algorithm. In order to obtain an independent estimate of their values the proton vertical intensities in the atmosphere were calculated, adjusting the parameters until the curves fit the experimental proton data, and then assumed that these values were identical in antinucleon-nucleus collisions. Author

N85-34095*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SECONDARY ANTIPROTON PRODUCTION IN RELATIVISTIC PLASMAS
C. D. Dermer and R. Ramaty *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 338-341 refs (For primary document see N85-34006 22-93)
(OG-6.1-4) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The possibility is investigated that the reported excess low energy antiproton component of the cosmic radiation results from proton-proton (p-p) interactions in relativistic plasmas. Because of both target and projectile motion in such plasmas, the antiproton production threshold in the frame of the plasma is much lower than the threshold of antiproton production in cosmic ray interactions with ambient matter. The spectrum of the resultant antiprotons therefore extends to much lower energy than in the cosmic ray case. The antiproton spectrum is calculated for relativistic thermal plasmas and the spectrum is estimated for relativistic nonthermal plasmas. As possible production sites, matter accreting onto compact objects located in the galaxy is considered. Possible overproduction of gamma rays from associated neutral pion production can be avoided if the site is optically thick to the photons but not to the antiprotons. A possible scenario involves a sufficiently large photon density that the neutral pion gamma rays are absorbed by photon-photon pair production. Escape of the antiprotons to the interstellar medium can be mediated by antineutron production. Author

N85-34096*# Kiel Univ. (West Germany). Inst. fuer Reine und Angewandte Kernphysik.
THE FLUX OF SECONDARY ANTI-DEUTERONS AND ANTI-HELIUM PRODUCED IN THE INTERSTELLAR MEDIUM
O. C. Allkofer and D. Brockhausen *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 342-345 refs Previously announced in IAA as A85-29237 (For primary document see N85-34006 22-93)
(OG-6.1-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Several measurements were performed to find antiprotons in the primary cosmic radiation. Because it is difficult to get completely separated secondarily produced antiprotons from primary ones, calculations based on accelerator results were performed for the flux of secondarily produced anti-deuterons and antihelium. Author

N85-34097*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
ANALYSIS OF EXPERIMENTAL DATA ON INTERSTELLAR ANTIPROTONS IN THE LIGHT OF MEASUREMENTS OF HIGH-ENERGY ELECTRONS AND He-3 NUCLEI
L. C. Tan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 346-349 refs (For primary document see N85-34006 22-93)
(OG-6.1-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The interstellar antiproton calculations were reexamined in view of the recent progress in measurements of interstellar electrons and He(3) nuclei. It was found that the divergence between the predicted antiproton flux and the existing datum at very low energies is increased. The proposed nonuniform galactic disk (NUGD) model qualitatively explains the unexpectedly large flux of interstellar antiprotons. Some ambiguities existed in the prototype of the model. It was unclear what fraction of observed antiprotons is of local origin. Previously the value of cosmic ray escape pathlength was suggested with quite a large arbitrariness. Author

N85-34098*# Tata Inst. of Fundamental Research, Bombay (India).
OBSERVED ANTIPROTONS AND ENERGY DEPENDENT CONFINEMENT OF COSMIC RAYS: A CONFLICT?
S. A. Stephens *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 350-353 refs (For primary document see N85-34006 22-93)
(OG-6.1-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

In the frame work of energy dependent confinement for cosmic rays, the energy spectrum inside the source is flatter than that observed. Antiproton observation suggests large amount of matter is being traversed by cosmic rays in some sources. As a result, secondary particles are produced in abundance. Their spectra was calculated and it is shown that the energy dependent confinement model is in conflict with some observations. Author

N85-34099*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANTIPARTICLES IN THE EXTRAGALACTIC COSMIC RADIATION
F. W. Stecker and A. W. Wolfendale (Durham Univ.) *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 354-357 refs (For primary document see N85-34006 22-93)
(OG-6.1-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

It may be possible to account for a previously puzzling

feature - a bump in the energy range 10 to the 14th power eV to 10 to the 15th power - of the cosmic ray spectrum by hypothesizing a primary extragalactic origin for the bulk of the observed cosmic ray antiprotons, although such an explanation is not unique. In this model, most of the cosmic rays above 10 to the 15th power eV are extragalactic. A method is described of testing this hypothesis experimentally. Author

N85-34100*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GALACTIC COSMIC RAY ANTIPROTONS AND SUPERSYMMETRY
F. W. Stecker, T. Walsh (Minnesota Univ., Minneapolis), and S. Rudaz (Minnesota Univ., Minneapolis) *In its* 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 358-361 refs (For primary document see N85-34006 22-93)
(OG-6.1-9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The physics of the annihilation of photinos is considered as a function of mass in detail, in order to obtain the energy spectra of the cosmic ray antiprotons produced under the assumption that photinos make up the missing mass in the galactic halo. The modulated spectrum is at 1 a.w. with the cosmic ray antiprotons data. A very intriguing fit is obtained to all of the present antiprotons up to 13.4 GeV data for similar to 15 GeV. A cutoff is predicted in the antiprotons spectrum at E = photino mass above which only a small flux from secondary production should remain. Author

N85-34101*# Academy of Sciences (USSR), Leningrad. Physical-Technical Inst.
GALACTIC ANTIPROTONS OF 0.2-2 GeV ENERGY
E. A. Bogomolov, G. I. Vasilyev, M. G. Iodko, S. Yu. Krutkov, N. D. Lubyanaya, V. A. Romanov, S. V. Stepanov, and M. S. Shulakova *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 362-365 refs (For primary document see N85-34006 22-93)
(OG-6.1-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Balloon measurements of the galactic antiproton flux in the energy range 0.2 GeV to 2 GeV are presented. The experiments were carried out in the summer of 1984 with magnet spectrometers flown at a residual pressure of approximately 10 g sq cm and cut off rigidity of approximately 0.6 GV. An upper limit for the antiproton to proton flux ratio has been obtained of antiproton/proton (0.2 GeV to 2 GeV) less than 5 x .0001. Author

N85-34102*# South Carolina Univ., Columbia. Dept. of Geology.
EVIDENCE FOR A DYNAMICAL HALO AROUND THE EDGE-ON GALAXY NGC 4631
I. Lerche and R. Schlickeiser (Max-Planck-Inst. fuer Radioastronomie, Bonn) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 366-369 refs (For primary document see N85-34006 22-93)
(OG-6.2-1) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Radio continuum observations at five frequencies between 327 MHz and 10.7 GHz of the edge on galaxy NGC 4631 confirm the prediction concerning the frequency dependence of the halo extent and the spatial variations of the radio spectral indices in the dynamical halo model made by Lerche and Schlickeiser. The measurements are presented, and a detailed comparison with theoretical predictions is made. Author

N85-34103*# Tata Inst. of Fundamental Research, Bombay (India).
HALO OF NGC 4631 AND MODELS OF COSMIC-RAY TRANSPORT
R. Cowsik and S. Sukamar *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 370-373 refs (For primary document see N85-34006 22-93)
(OG-6.2-3) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The halo of edge on spiral galaxy of NGC 4631 is studied from 327 MHz to 10700 MHz to delineate the models of cosmic ray transport. Preliminary studies show that the spectral steepening as a function of height above the plane can be understood in terms of the simplest cosmic ray transport models, viz., simple isotropic diffusion in an infinite medium. Author

N85-34104*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
OBSERVATION OF COSMIC RAY POSITRONS FROM 5 TO 25 GeV
R. L. Golden (New Mexico State Univ., Las Cruces), B. G. Mauger (New Mexico State Univ., Las Cruces), S. Horan (New Mexico State Univ., Las Cruces), G. D. Badhwar, J. L. Lacy, J. E. Zipse, R. R. Daniel (Tata Inst. for Fundamental Research, Bombay), and S. A. Stephens (Tata Inst. for Fundamental Research, Bombay) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 374-377 refs (For primary document see N85-34006 22-93)
(OG-6.2-5) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The positron data gathered in conjunction with electron data published elsewhere is reported. The basic recognition scheme was to look for low mass positive particles that cause a cascade in a 7 radiation length shower counter. The mass criteria is imposed by selecting particles that were accompanied by Cherenkov light but whose rigidity was below the proton Cherenkov threshold. Thus the proton Cherenkov threshold represents an upper limit to the range of the experiment. Author

N85-34105*# Chicago Univ., Ill.
AN OBSERVATION OF COSMIC RAY POSITRONS FROM 10-20 GeV
Dietrich Mueller and Jonathan Tang *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 378-381 refs (For primary document see N85-34006 22-93) (Grant NsG-7464)
(OG-6.2-6) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A balloon flight of the University of Chicago electron telescope was performed. Making use of the east-west asymmetry in the geomagnetic cut off rigidity, the cosmic ray positrons and negatrons were separated over the range 10 GeV to 20 GeV. The positron to electron ratio, e+/(e++e-), was measured to be 17% + or - 5%, significantly higher than the ratio measured in the 1 GeV to 10 GeV range by other experiments. This increase appears to suggest that either a primary component of positrons become significant above 10 GeV, or that the spectrum of primary negatrons decreases above 10 GeV more sharply than that of secondary positrons. Author

N85-34106*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
SPECTRAL SHAPE VARIATION OF INTERSTELLAR ELECTRONS AT HIGH ENERGIES
L. C. Tan *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 382-385 refs (For primary document see N85-34006 22-93)
(OG-6.2-7) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

The high energy electron spectrum analysis has shown that the electron intensity inside the H2 cloud region, or in a spiral arm, should be much lower than that outside it and the observed electron energy spectrum should flatten again at about 1 TeV. In the framework of the leady box model the recently established rigidity dependence of the escape pathlength of cosmic rays would predict a high energy electron spectrum which is flatter than the observed one. This divergence is explained by assuming that the leaky box model can only apply to cosmic ray heavy nuclei, and

light nuclei and electrons in cosmic rays may have different behaviors in the interstellar propagation. Therefore, the measured data on high energy electrons should be analyzed based on the proposed nonuniform galactic disk (NUGD) mode. Author

N85-34107*# Hong Kong Univ. Dept. of Physics.
REESTIMATION OF THE PRODUCTION SPECTRA OF COSMIC RAY SECONDARY POSITRONS AND ELECTRONS IN THE ISM
C. M. Wong and L. K. Ng *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 386-389 refs (For primary document see N85-34006 22-93)
(OG-6.2-8) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

A detailed calculation of the production spectra of charged hadrons produced by interactions of cosmic rays in the interstellar medium is presented along with a thorough treatment of pion and muon decays. Newly parameterized inclusive cross sections of hadrons were used and exact kinematic limitations were taken into account. Single parametrized expressions for the production spectra of both secondary positrons and electrons in the energy range .1 to 100 GeV are presented. The results are compared with other authors' predictions. Equilibrium spectra using various models are also presented. Author

N85-34108*# Tata Inst. of Fundamental Research, Bombay (India).
ELECTRONS AND POSITRONS FROM EXPANDING SUPERNOVA ENVELOPES IN DENSE CLOUDS
S. A. Stephens *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 390-393 refs (For primary document see N85-34006 22-93)
(OG-6.2.9) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

If antiprotons in cosmic rays are produced as secondary particles in sources, it is expected that positrons are also created by the same process. The interstellar spectra of positrons and electrons are calculated by taking into account such sources. Spectra are then compared with observations. Author

N85-34109*# Commissariat a l'Energie Atomique, Saclay (France). Service d'Astrophysique.
THE ELECTRON SPECTRA IN THE SYNCHROTRON NEBULA OF THE SUPERNOVA REMNANT G 29.7-0.3
L. Koch-Miramond, R. Rocchia, F. A. Jansen (Leiden Univ.), R. Braun (Leiden Univ.), and R. H. Becker (California Univ., Davis) *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 394-397 refs (For primary document see N85-34006 22-93)
(OG-6.2-10) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

EXOSAT results obtained with the imaging instrument (CMA) and the medium energy proportional counters (ME) are discussed. Assuming that the featureless power-law spectrum obtained in the 2 to 10 keV range is synchrotron radiation from relativistic electrons, one derives constraints on magnetic field strength and age of the nebula. The energy spectra of the electrons responsible for the emission in the radio and X-ray ranges are discussed. The great similarity of the physical properties of G 29.7-0.3 and of three synchrotron nebulae containing a compact object observed to pulse in X-rays makes G 29.7 - 0.3 a very promising candidate for further search for pulsed emission. Further observations at infrared wavelengths might reveal the break(s) in the emitted spectrum expected from the radio and X-ray power-law indices and give us more information on the production of the electron populations responsible for the emission of the nebula. Author

N85-34110*# Beijing Teachers Coll. (China). Dept. of Physics.
RELATIVISTIC ELECTRON IN CURVED MAGNETIC FIELDS
Shuyuan An *In* NASA. Goddard Space Flight Center 19th Intern. Cosmic Ray Conf., Vol. 2 Aug. 1985 p 398-401 refs (For primary document see N85-34006 22-93)
(OG-6.2-11) Avail: NTIS HC as boxed set only $200/MF A01 per volume or E99 per entire set CSCL 03B

Making use of the perturbation method based on the nonlinear differential equation theory, the author investigates the classical motion of a relativistic electron in a class of curved magnetic fields which may be written as B=B(O,B sub phi, O) in cylindrical coordinates (R. phi, Z). Under general astrophysical conditions the author derives the analytical expressions of the motion orbit, pitch angle, etc., of the electron in their dependence upon parameters characterizing the magnetic field and electron. The effects of non-zero curvature of magnetic field lines on the motion of electrons and applicabilities of these results to astrophysics are also discussed. M.G.

N85-34111# Sandia Labs., Albuquerque, N. Mex.
TRANSIENT TWO-DIMENSIONAL SIMULATION OF SEU IN A CMOS SRAM CELL
J. S. Fu, C. L. Axness, and H. T. Weaver 22 Jul. 1985 6 p refs Presented at the 22nd Ann. Conf. on Nucl. and Space Radiation Effects, Monterey, Calif., 22 Jul. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008419; SAND-85-0632C; CONF-850711-2) Avail: NTIS HC A02/MF A01

Two-dimensional transient simulations of cosmic ion strikes on sensitive junctions of CMOS SRAM were carried out. The calculations determine time responses for transport variables of the four cross-coupled transistors and reveal the conditions for change of state or upset. DOE

N85-34112# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
INVESTIGATIONS OF THE CYCLOTRON RESONANCE EFFECTS IN THE X RAY SPECTRUM OF THE NEUTRON STAR HERCULES X-1 [UNTERSUCHUNGEN DER ZYKLOTRON-RESONANZEFFEKTE IM ROENTGENSPEKTRUM VON HER X-1]
Wolfgang Voges Mar. 1985 122 p refs In GERMAN
(MPE-191; ISSN-0178-0719) Avail: NTIS HC A06/MF A01

Balloon flight results concerning Her X-1 are discussed. The hard X-ray radiation was determined during the low-on low-off state, and agrees with measured curves. The 1.24 sec light curve shows a strongly different pulse form in the 3 phases of the 35 day period. The continuum spectra have the same spectral form in the three phases, but different intensity; line energy allows the calculation of the neutron star magnetic field strength. Intensity and form of the continuum, and the first harmonic line intensities agree well. The parameter describing the continuum and the spectral structure does not show time variability. The functional dependence of the cyclotron resonance energy on the 1.24 sec pulse phase is well fitted by a sine curve. The amplitude of the variation of emission line energy is 4 to 5 times higher than that of absorption line energy. The hard X-ray radiation originates from a hot optically thick layer of the polar cap. The cyclotron line appears in the absorption and shows a thermal Doppler broadening. Author (ESA)

N85-33135# Joint Publications Research Service, Arlington, Va.
YAKUTSK INSTITUTE'S COSMIC RAY RESEARCH FACILITY Abstract Only
B. Konovalov *In its* USSR Rept.: Space (JPRS-USP-84-006) 14 Nov. 1984 p 44-45 Transl. into ENGLISH from Izv. (Moscow), 3 Sep. 1984 p 3 (For primary document see N85-33128 22-12)
Avail: NTIS HC A08

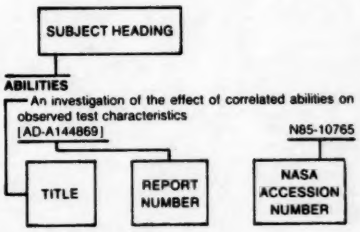
99 GENERAL

No abstracts in this category.

SUBJECT INDEX

SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS VOLUME 23 NUMBER 22

Typical Subject Index Listing



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A

ABLATION
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
Laser effects on opaque targets. Part 2C: Thermal effects of a time-variable beam intensity
[ISL-R-105/84-PT-2C] N85-33486

ABSORPTION CROSS SECTIONS
Determination of band oscillator strengths of atmospheric molecules from high resolution vacuum ultraviolet cross section measurements
[NASA-CR-176150] N85-33624
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742

ABSORPTION SPECTRA
Determination of band oscillator strengths of atmospheric molecules from high resolution vacuum ultraviolet cross section measurements
[NASA-CR-176150] N85-33624
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982

ABSORPTION SPECTROSCOPY
X-ray spectroscopy of solids under pressure
[DE85-011486] N85-33213

ABSTRACTS
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets
[AD-A155291] N85-33836
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 27)
[NASA-SP-7039(27)-SECTION-1] N85-33840

ABUNDANCE
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope
[OG-4.1-5] N85-34011
The energy dependence of the neon-22 excess in the cosmic radiation
[OG-4.3-7] N85-34032
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region 34 or = Z or = 48
[OG-4.4-3] N85-34036
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region Z or = 48
[OG-4.4-4] N85-34037
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3
[OG-4.4-5] N85-34038
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039
Capabilities of the LDEF-2 heavy nuclei collection
[OG-4.4-8] N85-34040
Ultraheavy cosmic ray tracks in meteorites: A reappraisal, based on calibrations with relativistic ions
[OG-4.4-10] N85-34041

AC GENERATORS
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300

ACCELERATION (PHYSICS)
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999

ACCIDENT PREVENTION
General Aviation Airworthiness Alerts, no. 85
[FAA-AC-43-16] N85-33117

ACCRETION DISKS
Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars
[OG-2.2-5] N85-33931
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934

ACCUMULATORS
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Multistage spent particle collector and a method for making same
[NASA-CASE-LEW-13914-1] N85-33489

ACCURACY
A method of accurizing rail guns
[LA-10026-MS] N85-33166
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411

ACID RAIN
Acid rain in Europe
[COMMITTEE-PRINT-99-F] N85-33601
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696

ACOUSTICAL HOLOGRAPHY
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753

ACOUSTICS
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753

ACOUSTO-OPTICS
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
Binary signal detection in acoustooptic receivers N85-33430
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431

ACRYLIC RESINS
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376

ACTINIDE SERIES
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
Capabilities of the LDEF-2 heavy nuclei collection
[OG-4.4-8] N85-34040

ACTINOMETERS
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149

ACTUATORS
Automatic rotary valve actuator
[DE85-012797] N85-33505
Design and development of a linear thermal actuator N85-33518
A dual, fault-tolerant aerospace actuator N85-33530
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531

ADAPTATION
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142

ADAPTIVE CONTROL
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111
Gradiental adaptive corrector with optimum tuning step N85-33403

ADAPTIVE FILTERS
Introduction to adaptive techniques for voice signal processing
[FUB-52-1983] N85-33287
Synthesis of adaptive filters for tracking radio systems N85-33325
High-speed adaptation algorithm for harmonic corrector N85-33336
Adaptive corrector operating in frequency domain N85-33337
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338

ADDING CIRCUITS
Hardware realization of digital filters without multipliers N85-33340

ADDITIVES
Experimental test for interpreting the increase in sensibility of doped CR-39
[OG-4.4-11] N85-34042

ADHESION TESTS
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F — aircraft structures
[PV-43-954/F] N85-33510

ADHESIVE BONDING
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33496
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F — aircraft structures
[PV-43-954/F] N85-33510

ADIABATIC CONDITIONS
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959

ADIABATIC EQUATIONS
Adiabatic thermal models for planetary bodies N85-33881

ADRENOCORTICOTROPIN (ACTH)
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681

AERIAL PHOTOGRAPHY
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155
AERODYNAMIC CHARACTERISTICS
Conceptual design and analysis of high-speed electronic imaging
[LA-10072-MS] N85-33292
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563
AERODYNAMIC CONFIGURATIONS
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle
[NASA-TP-2467] N85-33107
Energy efficient transport technology: Program summary and bibliography
[NASA-RF-1135] N85-33116
AERODYNAMIC FORCES
A review of shock waves around aeroassisted orbital transfer vehicles
[NASA-TM-86769] N85-33177
AERODYNAMIC STALLING
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
AERODYNAMICS
Aeronautical engineering: A continuing bibliography with indexes (supplement 189)
[NASA-SP-7037(189)] N85-33104
Nineteenth Aerospace Mechanisms Symposium
[NASA-CP-2371] N85-33512
AERONAUTICAL ENGINEERING
Aeronautical engineering: A continuing bibliography with indexes (supplement 189)
[NASA-SP-7037(189)] N85-33104
AERONAUTICS
Aeronautical engineering: A continuing bibliography with indexes (supplement 189)
[NASA-SP-7037(189)] N85-33104
AEROSOLS
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
Nordic Association for Aerosol Research (NOSA) Aerosol Symposium: Program and abstracts
[FOA-E-40019] N85-33616
AEROSPACE ENGINEERING
USSR report: Space
[JPRS-USP-84-006] N85-33128
Special tools used by cosmonauts in EVA N85-33129
AEROSPACE ENVIRONMENTS
Special tools used by cosmonauts in EVA N85-33129
Effects of environment on spacecraft materials N85-33144
AEROSPACE INDUSTRY
Management of Corrosion
[AGARD-LS-141] N85-33238
Corrosion management strategies for aircraft and related systems N85-33239
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240
Environmental factors in corrosion and deterioration of materials N85-33241
AEROSPACE MEDICINE
Results and prospects of physiological research during spaceflights N85-33139
Mechanisms of osteodystrophy in weightlessness N85-33143
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Labyrinthine and extralabyrinthine mechanisms of development of motion sickness in weightlessness N85-33668
AEROSPACE SYSTEMS
Nineteenth Aerospace Mechanisms Symposium
[NASA-CP-2371] N85-33512
AEROSPACE TECHNOLOGY TRANSFER
USSR report: Space
[JPRS-USP-84-006] N85-33128
AEROTHERMOCHEMISTRY
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
AGRICULTURE
Deficit irrigation feasibility study and demonstration project
[DE85-011531] N85-33555
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
AIR
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813
AIR DEFENSE
Assured information flow capping architecture
[AD-A155392] N85-33283
AIR POLLUTION
Acid rain in Europe
[COMMITTEE-PRINT-99-F] N85-33601
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
ARAC status report, 1985
[DE85-012835] N85-33603
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Atmospheric reaction products from hazardous air pollutant degradation
[PB85-185841] N85-33620
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696
AIR QUALITY
Soil extraction kit
[AD-D011736] N85-33190
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
MELSAR: A mesoscale air quality model for complex terrain. Volume 1: Overview, technical description and user's guide
[DE85-010943] N85-33608
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
AIR SAMPLING
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream
[DE85-011357] N85-33214
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
AIR TRAFFIC
System safety study of minimum TCAS 2 for instrument weather conditions
[FAA/PM-85-12] N85-33113
AIR TRAFFIC CONTROL
System safety study of minimum TCAS 2 for instrument weather conditions
[FAA/PM-85-12] N85-33113
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699
AIR TRAFFIC CONTROLLERS (PERSONNEL)
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699
AIR WATER INTERACTIONS
Study of molecular diffusivity influence on mass transfer rate at a water-atmosphere interface N85-33222
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
AIRBORNE/SPACEBORNE COMPUTERS
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833
AIRCRAFT
Removable cleanable antireflection shield
[AD-D011735] N85-33810
AIRCRAFT CONSTRUCTION MATERIALS
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120
AIRCRAFT CONTROL
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
AIRCRAFT DESIGN
Energy efficient transport technology: Program summary and bibliography
[NASA-RF-1135] N85-33116
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120
Maintenance and the military environment N85-33243
AIRCRAFT ENGINES
Elevated temperature crack growth
[NASA-CR-174957] N85-33540
AIRCRAFT EQUIPMENT
General Aviation Airworthiness Alerts, no. 85
[FAA-AC-43-16] N85-33117
AIRCRAFT INSTRUMENTS
The development and evaluation of color display systems for airborne applications. Phase 1: Fundamental visual, perceptual, and display system considerations
[FAA/PM-85-19] N85-33700
AIRCRAFT LANDING
Application of frequency domain handling qualities criteria to the longitudinal landing task
[NASA-TM-86728] N85-33124
AIRCRAFT MAINTENANCE
Corrosion management strategies for aircraft and related systems N85-33239
Relating corrosion maintenance to environmental factors N85-33247
AIRCRAFT MANEUVERS
System safety study of minimum TCAS 2 for instrument weather conditions
[FAA/PM-85-12] N85-33113
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
AIRCRAFT NOISE
A theoretical appraisal of the use of ground-plane microphones for aircraft noise measurements
[NPL-AC-103] N85-33752
AIRCRAFT PERFORMANCE
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119
AIRCRAFT SAFETY
General Aviation Airworthiness Alerts, no. 85
[FAA-AC-43-16] N85-33117
AIRCRAFT STRUCTURES
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F — aircraft structures
[PV-43-954/F] N85-33510
AIRFOIL PROFILES
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N85-33110
AIRFOILS
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N85-33110
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112

Local heat-transfer measurements on a large, scale-model turbine blade airfoil using a composite of a heater element and liquid crystals
[NASA-TM-86900] N85-33435

ALASKA
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591

ALBEDO
The distribution of compositional classes in the asteroid belt: A cosmochemical fingerprint? N85-33856
Interpretation of photometric measurements of airless bodies N85-33871

ALERTNESS
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694

ALGAE
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684

ALGEBRA
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443

ALGORITHMS
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Implementation of the SITAN algorithm in the digital terrain management and display system
[DE85-010659] N85-33115
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
High-speed adaptation algorithm for harmonic corrector N85-33336
State of art and development problems in computer-aided design of electronic circuits N85-33342
Modeling of electronic circuits with high degree of component integration N85-33343
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
Algorithms for constructing models of circuit elements in input language of computer-aided design software N85-33356
Algorithm for determination of isomorphic graphs N85-33357
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
Gradiental adaptive corrector with optimum tuning step N85-33403
Multishaker modal testing
[NASA-CR-176139] N85-33544
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709
Parallel Cholesky factorization in message-passing multiprocessor environments
[DE85-012079] N85-33717
An algorithm for the generation of primitive polynomials
[FUB-17-1984] N85-33730
Research on distributed artificial intelligence
[AD-A155356] N85-33733
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739

ALIGNMENT
Accelerator vibration issues
[DE85-010766] N85-33791

ALKALI METALS
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream
[DE85-011357] N85-33214

ALKALIES
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755

ALKANES
Soil extraction kit
[AD-D011736] N85-33190

ALLOYS
Management of Corrosion
[AGARD-LS-141] N85-33238
Corrosion management strategies for aircraft and related systems N85-33239
Maintenance and the military environment N85-33243
Protective systems and maintenance policies for marine environments N85-33245

ALPHA PARTICLES
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808

ALTERNATING CURRENT
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374

ALTITUDE
Terrain illumination conditions when taking scanning photographs from space N85-33159

ALTITUDE ACCLIMATIZATION
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666

ALUMINUM
Properties of Ti-6Al-4V spun formed fuze supports
[DE85-011968] N85-33498
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031

ALUMINUM ALLOYS
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228

ALUMINUM ISOTOPES
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002

ALUMINUM OXIDES
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
Preparation and use of very pure o-D2
[DE85-009415] N85-33800

ALUMINUM 26
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003

AMERICIUM 241
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611

AMINES
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772

AMINO ACIDS
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678

AMORPHOUS MATERIALS
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators
[DE85-010827] N85-33230
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828

AMORPHOUS SEMICONDUCTORS
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582

AMPLIFICATION
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111

AMPLIFIERS
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
Synthesis of high-speed devices using integrated operational amplifiers N85-33428

AMPLITUDES
Amplitude stabilization of pulse signals N85-33320
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
Generalized string amplitude and wave equation for hadrons
[DE85-011492] N85-33798
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075

ANAEROBES
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659

ANALOG CIRCUITS
System for computer-aided design of analog electronic circuits N85-33353
Microcomputer controlled image processor
[AD-D011734] N85-33735

ANALOG DATA
Design of high-order analog and digital filters with identical sections N85-33341

ANALOG TO DIGITAL CONVERTERS
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points
[NASA-CASE-MFS-25319-1] N85-33701
Microcomputer controlled image processor
[AD-D011734] N85-33735

ANALOGIES
Application of field similitude theory to calculation of stripline heating N85-33419
Some plant location problems — computer networks
[FUB-14-1984] N85-33746

ANGLE OF ATTACK
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N85-33110

ANGLES (GEOMETRY)
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071

ANGULAR ACCELERATION
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690

ANGULAR MOMENTUM
Interacting Boson approximation
[DE85-003016] N85-33756

ANGULAR RESOLUTION
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
A search for sources of ultra high energy gamma rays at air shower energies with Ooty EAS array
[OG-2.6-8] N85-33970

ANIMALS
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Antihypertensive neutral lipid
[DE85-011625] N85-33656

ANISOTROPIC MEDIA
Examination of anisotropic films by resonance method N85-33412

ANISOTROPY
Shear wave transducer for boreholes
[DE85-011662] N85-33461
The effect of anisotropic emission on the log N-log S curve of gamma-ray bursts
[OG-1.2-4] N85-33914
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
Anisotropy of cosmic rays of energy 10 (15) eV to 10 (17) eV observed at Akeno
[OG-5.3-3] N85-34070
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072
Arrival direction distribution of cosmic rays of energy 10 (18) eV
[OG-5.3-7] N85-34073
Air shower arrival directions measured at Buckland Park
[OG-5.3-11] N85-34077
A simulation of high energy cosmic ray propagation 2
[OG-5.4-2] N85-34079
Implications of the experimental results on high energy cosmic rays with regard to their origin
[OG-5.4-5] N85-34082
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34085

Modeling cosmic ray anisotropies near 10(18) eV
[OG-5.4-9] N85-34086
Anisotropy and the knee of the energy spectrum
[OG-5.4-10] N85-34087
A model for the proton spectrum and cosmic ray anisotropy
[OG-5.4-12] N85-34089
On galactic origin of cosmic rays with energy up to 10(19) eV
[OG-5.4-15] N85-34091

ANNEALING
Metallic glass composition
[DE85-011594] N85-33253

ANNIHILATION REACTIONS
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Annihilation radiation in cosmic gamma-ray bursts
[OG-1.1-3] N85-33905
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
Neutrino-antineutrino annihilation around collapsing star
[OG-1.1-10] N85-33911
Diffuse galactic annihilation radiation from supernova nucleosynthesis
[OG-3.2-8] N85-34004
Galactic cosmic ray antiprotons and supersymmetry
[OG-6.1-9] N85-34100

ANOMALIES
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888

ANORTHOSITE
Primordial magmaspheres and their lasting consequences N85-33882

ANTENNA ARRAYS
Radio telescope with 256 antennas built in Siberia N85-33136
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Adaptive synthesis of antennas with separation of signals by direction of arrival N85-33328
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387
Minimizing field scattered by slender dipoles N85-33388

ANTENNA DESIGN
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387

ANTENNA FEEDS
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Method of constructing folding umbrella-type antenna N85-33386
Minimizing field scattered by slender dipoles N85-33388

ANTENNA RADIATION PATTERNS
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318
Method of constructing folding umbrella-type antenna N85-33386
Minimizing field scattered by slender dipoles N85-33388

ANTENNAS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Method of constructing folding umbrella-type antenna N85-33386
High-field launch electron cyclotron heating experiments in the ELMO Bumpy Torus
[DE85-012068] N85-33825

ANTHRACENE
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193

ANTINEUTRINOS
Neutrino-antineutrino annihilation around collapsing star
[OG-1.1-10] N85-33911

ANTIPARTICLES
Search for heavy antinuclei in the cosmic radiation
[OG-6.1-2] N85-34093
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096

ANTIPROTONS
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
Nineteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
Secondary antiproton production in relativistic plasmas
[OG-6.1-4] N85-34095
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Antiparticles in the extragalactic cosmic radiation
[OG-6.1-8] N85-34099
Galactic cosmic ray antiprotons and supersymmetry
[OG-6.1-9] N85-34100
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101

ANTIREFLECTION COATINGS
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Removable cleanable antireflection shield
[AD-D011735] N85-33810

APPENDAGES
The design and development of a spacecraft appendage tie down mechanism N85-33522

APPROPRIATIONS
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173

APPROXIMATION
Maximally flat approximation of attenuation characteristics of coupled-line filters N85-33393
Interacting Boson approximation
[DE85-003016] N85-33756

ARCHITECTURE
Assured information flow capping architecture
[AD-A155392] N85-33283

ARCHITECTURE (COMPUTERS)
Basic features of personal computers N85-33344
Flat is not necessarily good
[DE85-012819] N85-33723

ARCTIC REGIONS
Arctic and offshore research
[DE85-001995] N85-33653

ARGON
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826
Apparatus and method for the horizontal, crucible-free growth of silicon sheet crystals
[DE85-011588] N85-33829

ARGON ISOTOPES
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609

ARID LANDS
Comprehensive mapping of arid territories of Arizona using space photography N85-33164

ARMED FORCES
Maintenance and the military environment N85-33243

AROMATIC COMPOUNDS
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270

ARRAYS
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
Mosaic Infrared Sensor for Space Astronomy (MIRSSA)
[NASA-CR-176154] N85-33456
Electromagnetic inspection of wire ropes using sensor arrays
[AD-A155412] N85-33509
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
Air shower arrival directions measured at Buckland Park
[OG-5.3-11] N85-34077

ARSENIC
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605

ARTIFICIAL INTELLIGENCE
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Space robot simulator vehicle
[NASA-CR-176133] N85-33176
Future of robots in nuclear plants and processes
[DE85-011505] N85-33500
Machine intelligence for robotics applications
[DE85-011430] N85-33503
Flat is not necessarily good
[DE85-012819] N85-33723

ARTIFICIAL SATELLITES
Far travelers: The exploring machines
[NASA-SP-480] N85-33126
On the principle of uniformity of satellite communications systems N85-33382

ASIA
The 2nd World Meteorological Association Regional Association (Asia), 8th session
[WMO-642] N85-33643

ASSAYING
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655

ASSEMBLIES
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Latch assembly
[DE85-011660] N85-33492
Two-plane balance and slip-ring design N85-33536

ASTEROID BELTS
The distribution of compositional classes in the asteroid belt: A cosmochemical fingerprint? N85-33856

ASTRONAUTS
Results of microbiological studies conducted during operation of Salyut-6 orbital station N85-33682

ASTRONOMICAL CATALOGS
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network
[OG-1.2-1] N85-33912
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915

ASTRONOMICAL OBSERVATORIES
Program for observations of Halley's comet N85-33138

ASTRONOMICAL TELESCOPES
Radio telescope with 256 antennas built in Siberia N85-33136

ASTROPHYSICS
Yakutsk Institute's cosmic ray research facility N85-33135
Program for observations of Halley's comet N85-33138

ASYMMETRY
Multidiode integrated-circuit protective device N85-33425
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819

ASYMPTOTIC METHODS
Turbulent mixing and combustion N85-33207

ATMOSPHERIC BOUNDARY LAYER
Verification of Doppler sodar measurements — atmospheric boundary layer
[KNMI-WR-85-2] N85-33645

ATMOSPHERIC CHEMISTRY
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Ozone during sudden stratospheric warming: A three-dimensional simulation
[AERONOMICA-ACTA-A-292-1984] N85-33621
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra
[AERONOMICA-ACTA-A-295-1985] N85-33623
Middle Atmosphere Program. Handbook for MAP, volume 11
[NASA-CR-176107] N85-33625

ATMOSPHERIC CIRCULATION
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field
[NASA-TM-87581] N85-33436
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
Radar wind profilers in the Colorado network
[PB85-185486] N85-33647
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648

ATMOSPHERIC COMPOSITION
MELSAR: A mesoscale air quality model for complex terrain. Volume 1: Overview, technical description and user's guide
[DE85-010943] N85-33608
Atmospheric reaction products from hazardous air pollutant degradation
[PB85-185841] N85-33620
Ozone during sudden stratospheric warming: A three-dimensional simulation
[AERONOMICA-ACTA-A-292-1984] N85-33621
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra
[AERONOMICA-ACTA-A-295-1985] N85-33623
Middle Atmosphere Program. Handbook for MAP, volume 11
[NASA-CR-176107] N85-33625
ATMOSPHERIC DIFFUSION
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
ATMOSPHERIC EFFECTS
A review of shock waves around aeroassisted orbital transfer vehicles
[NASA-TM-86769] N85-33177
ATMOSPHERIC HEATING
Ozone during sudden stratospheric warming: A three-dimensional simulation
[AERONOMICA-ACTA-A-292-1984] N85-33621
ATMOSPHERIC MODELS
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field
[NASA-TM-87581] N85-33436
ATMOSPHERIC PHYSICS
Middle Atmosphere Program. Handbook for MAP, volume 11
[NASA-CR-176107] N85-33625
National Center for Atmospheric Research
[PB85-191237] N85-33835
ATMOSPHERIC PRESSURE
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
ATMOSPHERIC RADIATION
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
ATMOSPHERIC SOUNDING
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements
[NOAA-TR-NESDIS-23] N85-33626
ATMOSPHERIC TEMPERATURE
Monthly and seasonal weather outlook for April 1985, March 30, 1985, volume 39, no. 7
[PB85-183804] N85-33646
ATOMIC STRUCTURE
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228
ATOMIC WEIGHTS
The inner granulometric density of the tracks in nuclear emulsions and its application to determine the chemical spectrum of primary cosmic ray nuclidi
[OG-4.3-9] N85-34034
ATTENUATION COEFFICIENTS
Precision microwave attenuation measurement by time interval ratio
[RSRE-85005] N85-33280
ATTITUDE (INCLINATION)
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
ATTITUDE CONTROL
Deployable-erectable trade study for space station truss structures
[NASA-TM-87573] N85-33181
ATTITUDE STABILITY
The design and development of a constant-speed solar array drive N85-33519
AUSTENITIC STAINLESS STEELS
Reactor pressure vessel steels ASME SA533B and SA508 C 1.2
[VTT-340] N85-33507
AUTOMATA THEORY
Computer science: Key to a space program renaissance. The 1981 NASA/ASEE summer study on the use of computer science and technology in NASA. Volume 2: Appendices
[NASA-CR-175295] N85-33702
AUTOMATIC CONTROL
Space station automation study. Automation requirements derived from space manufacturing concepts. Volume 1: Executive summary
[NASA-CR-176099] N85-33170
Space Station automation study. Automation requirements derived from space manufacturing concepts. Volume 2: Technical report
[NASA-CR-176100] N85-33171
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173
Statement of Aaron Cohen, Director, Research and Engineering, Johnson Space Center and Chairman, Space Station Advanced Technology Advisory Committee, National Aeronautics and Space Administration, before the Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, United States Senate
[NASA-TM-87497] N85-33174
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197
Probabilistic analysis of automatic control systems for detection systems N85-33335
Robotic order picking
[AD-D011737] N85-33493
Automatic rotary valve actuator
[DE85-012797] N85-33505
AUTOMATIC FREQUENCY CONTROL
High-speed adaptation algorithm for harmonic corrector N85-33336
AUTOMATIC PILOTS
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
AUTOMATION
Robotic order picking
[AD-D011737] N85-33493
AUTOMOBILE ENGINES
Durability of oxygen sensors
[PB85-183093] N85-33477
AUTOMOBILES
Fuel cell applications literature review
[DE85-011891] N85-33592
AUTONOMY
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
AVALANCHE DIODES
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
AVERAGE
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points
[NASA-CASE-MFS-25319-1] N85-33701
AXIAL FLOW
Second order modelling in non-constant density flows N85-33206
AXISYMMETRIC FLOW
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field
[NASA-TM-87581] N85-33436
AZIMUTH
Terrain illumination conditions when taking scanning photographs from space N85-33159
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160

B

BACKGROUND NOISE
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
BACKGROUND RADIATION
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
BACTERIA
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684
Legionnaires' disease bacteria in power plant cooling systems: Phase 2
[DE85-011546] N85-33695
BACTERIOLOGY
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683
BALANCE
Two-plane balance and slip-ring design N85-33536
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
BALL BEARINGS
The properties of thin-section, four-point-contact ball bearings in space N85-33521
The use of perfluoroether lubricants in unprotected space environments N85-33523
BALLISTICS
Conceptual design and analysis of high-speed electronic imaging
[LA-10072-MS] N85-33292
BALLOON SOUNDING
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Observations of ultraheavy cosmic ray particles at 10 GV cutoff rigidity
[OG-4.4-2] N85-34035
BALLOON-BORNE INSTRUMENTS
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648
BALLOONS
Balloon observations of hard X-rays from some galactic X-ray sources
[OG-2.5-11] N85-33966
Gamma-radiation with E gamma 5 MeV detected from Seyfert galaxy 3C120 and region with 1' = 190 deg and b' = 20 deg
[OG-2.8-8] N85-33981
BANDPASS FILTERS
Design of high-order analog and digital filters with identical sections N85-33341
Design of digital bandpass filters with finite memory N85-33392
Miniature two-mode filters N85-33394
Method of designing digital band-pass filters with pulse response of finite duration N85-33395
Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
BANDWIDTH
Controllable companding in low-frequency FM radio communication systems N85-33402
BARIUM
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
BASALT
Primordial magmaspheres and their lasting consequences N85-33882
BASIC (PROGRAMMING LANGUAGE)
How a BASIC program works
[DE85-009142] N85-33727
BATTERY CHARGERS
Safety characteristics of non-lithium battery systems
[AD-A155733] N85-33574
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
BAYES THEOREM
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
BEAM CURRENTS
The cw operation of the FMIT RFQ accelerator
[DE85-012667] N85-33757
BEAM INJECTION
The cw operation of the FMIT RFQ accelerator
[DE85-012667] N85-33757
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
Rf program for LAMPF 2
[DE85-012693] N85-33760
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788
Design status of heavy ion injector program
[DE85-010751] N85-33793
BEAMS (RADIATION)
Design of electrooptical system with annular cathode and electrostatic compressor N85-33367

Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
Materials characterization with intense positron beams
[DE85-011850] N85-33769
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788

BEARING (DIRECTION)
Arrival direction distribution of cosmic rays of energy 10 (18) eV
[OG-5.3-7] N85-34073
Observation of arrival times of EAS with energies or = 6 x 10 (14) eV
[OG-5.3-8] N85-34074

BEDROCK
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634

BELGIUM
150 years of meteorology in Belgium N85-33642

BENZENE
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655

BERYLLIUM ISOTOPES
Galactic propagation models consistent with the cosmic ray lifetime derived from Be-10 measurements
[OG-4.3-1] N85-34026

BETA FACTOR
System and method of operating toroidal magnetic confinement devices
[DE85-011670] N85-33814

BETA PARTICLES
Beta response of selected instruments
[DE85-013278] N85-33469

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[AD-A155383] N85-33553
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[DE85-011482] N85-33768
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 27)
[NASA-SP-7039(27)-SECTION-1] N85-33840

BINARY ALLOYS
Thermodynamic properties of alloys in the Fe-Ti system
[NPL-DMA(A)-96] N85-33229

BINARY DIGITS
Basic features of personal computers N85-33344

BINARY STARS
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
Constraints on cosmic-ray observation of Cygnus X-3
[OG-2.2-3] N85-33930
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
The 4U 0115+63: Another energetic gamma ray binary pulsar
[OG-2.6-11] N85-33973

BIOASSAY
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466

BIOCHEMISTRY
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660

BIOCONVERSION
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591

BIODEGRADATION
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659

BIOENGINEERING
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192

BIOGEOCHEMISTRY
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189

BIOGRAPHY
Harold Hazen and the theory and design of servomechanism
[RR-270] N85-33506

BIOINSTRUMENTATION
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600

BIOLOGICAL EFFECTS
Nordic Association for Aerosol Research (NOSA) Aerosol Symposium: Program and abstracts
[FOA-E-40019] N85-33616
Antihypertensive neutral lipid
[DE85-011625] N85-33656
Microdosimetric spectra measurements of JANUS neutrons
[DE85-012108] N85-33801

BIOLOGICAL EVOLUTION
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867

BIOLOGICAL MODELS (MATHEMATICS)
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142

BIOMAGNETISM
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686

BIOMASS
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691

BIOMASS ENERGY PRODUCTION
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591

BIOPHYSICS
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660

BIOSATELLITES
General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite N85-33679

BIOSYNTHESIS
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658

BIOTECHNOLOGY
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192

BIPOLAR TRANSISTORS
Evaluation of semiconductor devices for Electric and Hybrid Vehicle (EHV) ac-drive applications, volume 2
[NASA-CR-176103] N85-33294

BIPOLARITY
Computer simulation of integrated injection logic N85-33349

BITS
Basic features of personal computers N85-33344

BLACK HOLES (ASTRONOMY)
Comments on RS-17 X-ray telescope N85-33132

BLANKETS (FUSION REACTORS)
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817
Blanket optimization studies for Cascade
[DE85-010002] N85-33824

BLOCH BAND
Analysis of solution of Bloch's equations in time domain N85-33371

BLOOD CIRCULATION
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688

BLOOD FLOW
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688

BLOOD PLASMA
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681

BLOOD PRESSURE
Antihypertensive neutral lipid
[DE85-011625] N85-33656
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677

BLOOD VESSELS
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676

BLOOD VOLUME
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664

BLUNT BODIES
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450

BOATTAILS
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450

BODY FLUIDS
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674

BODY KINEMATICS
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672

BODY SWAY TEST
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673

BODY TEMPERATURE
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687
Thermal stress suffered by tank crews working in summer heat
[DRIC-T-7492] N85-33698

BOMBER AIRCRAFT
Maintenance and the military environment N85-33243

BONDING
Non-bonded ultrasonic transducer
[DE85-011006] N85-33504

BONE MARROW
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686

BONES
Mechanisms of osteodystrophy in weightlessness N85-33143

BOOLEAN ALGEBRA
Synthesis of tests for programmable logic arrays N85-33408

BOOMS (EQUIPMENT)
The Galeleo spacecraft magnetometer boom N85-33513

BOREHOLES
Shear wave transducer for boreholes
[DE85-011662] N85-33461
Generation of round bores in composite structure railguns
[DE85-011872] N85-33501
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Lithology and stratigraphy of drill holes completed during 1984 in LANL use areas of Yucca Flat, Nevada Test Site, volume 6
[DE85-010695] N85-33631
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771

BORIDES
Consortium program for the study of boron-rich borides
[DE85-011378] N85-33260

BORON
Consortium program for the study of boron-rich borides
[DE85-011378] N85-33260

BOSONS
Interacting Boson approximation
[DE85-003016] N85-33756
BOUNDARY LAYER SEPARATION
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N85-33110
BOUNDARY LAYER TRANSITION
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
BOUNDARY VALUE PROBLEMS
Comments on two matters related to turbulent combustion N85-33204
Pressure correlations in turbulent reacting flows N85-33205
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
BRANCHING (MATHEMATICS)
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
BREEDER REACTORS
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817
BRIDGES (STRUCTURES)
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265
BRIGHTNESS
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
BRIGHTNESS TEMPERATURE
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements
[NOAA-TR-NESDIS-23] N85-33626
BRINES
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598
Proposed resource evaluation plan. Salton Sea scientific drilling program
[DE85-011294] N85-33633
BROMIDES
Determination of organobromide compounds in water by gas chromatography-negative ion chemical ionisation mass spectrometry
[DRIC-T-7411] N85-33199
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
BUBBLES
Experimental studies of glass refining
[NASA-CR-176130] N85-33248
BUMPY TORUSES
Elmo bumpy square plasma confinement device
[DE85-011628] N85-33816
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819
High-field launch electron cyclotron heating experiments in the ELMO Bumpy Torus
[DE85-012068] N85-33825
BUNCHING
Adaptive corrector operating in frequency domain N85-33337
BUOYANCY
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
BUTANES
Experimental study of engine knock
[DE85-009851] N85-33268
BY-PRODUCTS
Current regulatory and licensing status for byproduct sources, facilities and applications
[DE85-010967] N85-33796

C

C BAND
Strongly coupled millimeter-band waveguide directional couplers N85-33418
CADMIUM
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
CADMIUM SULFIDES
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826
CALCIUM
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
CALCIUM ISOTOPES
The isotopic composition of cosmic ray calcium
[OG-4.3-5] N85-34030
CALCIUM METABOLISM
Mechanisms of osteodystrophy in weightlessness N85-33143
CALCIUM OXIDES
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193
CALCULATORS
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411
CALIBRATING
On-line temperature sensor
[DE85-011641] N85-33465
Evaluation of coordinate measuring machines
[DE85-011712] N85-33467
IEA-SSPS CRS calibration report: Calibration of relevant measuring sensors
[DE85-010174] N85-33468
Beta response of selected instruments
[DE85-013278] N85-33469
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
CALIFORNIUM ISOTOPES
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833
CALORIMETERS
Cryogenic laser calorimetry for impurity analysis
[NASA-CR-176102] N85-33201
CAMERAS
Microcomputer controlled image processor
[AD-D011734] N85-33735
CANCER
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655
CANONICAL FORMS
Design of high-order analog and digital filters with identical sections N85-33341
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
CAPACITANCE
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
Capacitance measuring device
[DE85-011643] N85-33460
CAPACITORS
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300
Switching power supply
[DE85-005993] N85-33312
Capacitance measuring device
[DE85-011643] N85-33460
CARBIDES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
CARBOHYDRATES
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591
CARBON
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-60 GeV/n
[OG-4.1-6] N85-34012
CARBON CYCLE
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189
CARBON DIOXIDE
Thermophysical properties of fluids for the gas industry
[PB85-198471] N85-33227
Model projections of time-dependent response to increasing carbon dioxide
[DE85-013326] N85-33641
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33665
CARBON DIOXIDE LASERS
Sliding discharge in CO2 and excimer lasers N85-33379
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485
Hole cutting in building frames by laser
[FOA-C-20569-D9] N85-33487
CARBON FIBER REINFORCED PLASTICS
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197
Filament wound structures in PSP carbon composite
[RV10/84424] N85-33198
CARBON ISOTOPES
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027
CARBON MONOXIDE
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694
CARBONATES
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
Molten carbonate fuel cell separator
[DE85-011615] N85-33577
Effects of H2S on molten carbonate fuel cells. Literature review on the impact of SO2 in the oxidant supplied to molten carbonate fuel cells
[DE85-011698] N85-33586
CARCINOGENS
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655
CARDIOVASCULAR SYSTEM
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
CARRIAGES
Dual optical mechanical position tracker
[AD-D011739] N85-33811
CASTING
Method and apparatus for casting conductive and semi-conductive materials
[DE85-011655] N85-33494
CASTINGS
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
CATALYSTS
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles
[PB85-187961] N85-33453
CATALYTIC ACTIVITY
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191
CATHODE RAY TUBES
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
CAUCHY PROBLEM
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420

CAVITATION FLOW
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
CAVITIES
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33634
CAVITY RESONATORS
Cryogenic system for the University of Washington Superconducting Booster
[DE85-010604] N85-33274
High-power solid-state rf source for accelerator cavities
[DE85-012672] N85-33309
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783
CELESTIAL BODIES
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
CEMENTS
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263
CENTRIFUGAL FORCE
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
CERAMIC COATINGS
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
CERAMICS
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
Dispersion toughened ceramic composites and method for making same
[DE85-011601] N85-33252
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
Microstructure-mechanical property relationships in the transformation-toughened ceramics
[DE85-011946] N85-33261
Process and device for forming imprints on ceramic tubes
[DE85-013137] N85-33264
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Woven heat exchanger
[DE85-011633] N85-33439
Latch assembly
[DE85-011660] N85-33492
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
CEREBRUM
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
CERENKOV COUNTERS
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
CERENKOV RADIATION
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
Search for TeV gamma rays from extragalactic sources and the Galactic Center
[OG-2.7-1] N85-33976
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope
[OG-4.1-5] N85-34011
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope
[OG-4.3-4] N85-34029
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region 34 or = Z or = 48
[OG-4.4-3] N85-34036
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region Z or = 48
[OG-4.4-4] N85-34037
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3
[OG-4.4-5] N85-34038
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039
A new measurement of the cosmic ray energy spectrum between 3 x 10 to the 15th power eV and 3 x 10 to the 16th power eV
[OG-5.1-6] N85-34048
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055
Cosmic ray spectra measurements at the Yakutsk EAS array
[OG-5.1-17] N85-34058
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
CERIUM
Trivalent cerium doped crystals as tunable laser systems: Two bad apples
[DE85-008168] N85-33482
CERIUM OXIDES
Defect interactions at high concentrations in solid oxide electrolytes
[DE85-011824] N85-33580
CESIUM
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
CESIUM 137
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1983
[CISE-2515] N85-33617
CHANNELS
Current enhancement in a conducting channel
[AD-A155418] N85-33812
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813
CHANNELS (DATA TRANSMISSION)
Adaptive corrector operating in frequency domain N85-33337
Optimum predistortion of digital signals for transmission over parallel channels N85-33397
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33398
CHARGE COUPLED DEVICES
Microcomputer controlled image processor
[AD-D011734] N85-33735
CHARGE DISTRIBUTION
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020
CHARGE EXCHANGE
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
CHARGED PARTICLES
Multistage spent particle collector and a method for making same
[NASA-CASE-LEW-13914-1] N85-33489
Bibliography and index for nuclear reactions among light charged particles, volume 26
[DE85-011482] N85-33768
Heavy quarks and CP: Moriond 1985
[DE85-010553] N85-33790
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
CHARTS
Dialog system with minicomputer for plotting performance charts N85-33355
CHELATES
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772
CHEMICAL COMPOSITION
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217
Experimental studies of glass refining
[NASA-CR-176130] N85-33248
Metallic glass composition
[DE85-011594] N85-33253
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
A new method to determine the chemical composition of the cosmic rays beyond 10 to the 15th power eV
[OG-5.1-11] N85-34052
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
The primary composition beyond 10 to the 5th power GeV as deduced from high energy hadrons and muons in air showers
[OG-5.2-6] N85-34063
CHEMICAL COMPOUNDS
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
CHEMICAL EQUILIBRIUM
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211
CHEMICAL EXPLOSIONS
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772
CHEMICAL FRACTIONATION
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189
CHEMICAL INDICATORS
Electrochromic display device
[AD-D011733] N85-33299
CHEMICAL PROPERTIES
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
Hydrazine nitrate based explosives
[ISL-CO-229/84] N85-33272
CHEMICAL REACTIONS
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
CHEMICAL TESTS
Soil extraction kit
[AD-D011736] N85-33190
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
CHEMISORPTION
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33226
CHEMISTRY
On the relationship between electronics and chemistry
[DRIC-T-7480] N85-33200
CHEMORECEPTORS
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600

CHLORIDES
Environmental surveillance at Los Alamos during 1984 [DE85-011886] N85-33605
CHLORINE
Method for removing chlorine compounds from hydrocarbon mixtures [DE85-011608] N85-33191
The isotopic composition of cosmic ray chlorine [OG-4.3-3] N85-34028
CHOLESKY FACTORIZATION
Parallel Cholesky factorization in message-passing multiprocessor environments [DE85-012079] N85-33717
CHONDRITES
Noble gases in meteorites and terrestrial planets N85-33850
Relationships between chondritic meteorites and planets N85-33851
Nebular volatile fractionations associated with chondruie formation N85-33855
CHROMATOGRAPHY
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules [DE85-012017] N85-33215
Supercritical fluid chromatography/supersonic jet spectroscopy [DE85-007005] N85-33221
Electrochromic display device [AD-D011733] N85-33299
CHROMIUM
Environmental surveillance at Los Alamos during 1984 [DE85-011886] N85-33605
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments [DE85-011928] N85-33808
CHROMIUM ISOTOPES
Experimental test for interpreting the increase in sensibility of doped CR-39 [OG-4.4-11] N85-34042
CHROMIUM STEELS
Fatigue behavior of chromium-containing ferritic steels at elevated temperature [DE85-012309] N85-33231
CHROMOSOMES
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography [DE85-011562] N85-33697
CINEMATOGRAPHY
Holographic cinematography with the help of a pulse YAG laser [ISL-CO-213/84] N85-33472
Cinehologrаphy [ISL-CO-214/84] N85-33473
CIRCUIT BOARDS
Heat sinking for printed circuitry [DE85-011585] N85-33440
CIRCUITS
State of art and development problems in computer-aided design of electronic circuits N85-33342
Algorithms and organization of software for computer-aided circuit design N85-33347
System for computer-aided design of analog electronic circuits N85-33353
Optimization of radioelectronic circuits with software for modeling of integrated circuits on unified system computer N85-33354
Dialog system with minicomputer for plotting performance charts N85-33355
Algorithms for constructing models of circuit elements in input language of computer-aided design software N85-33356
Electronic temperature equalizer [PB85-181485] N85-33475
CIRCULATION CONTROL AIRFOILS
Circulation control lift generation experiment: Hardware development N85-33535
CLADDING
Fiber optic moisture sensor [DE85-011651] N85-33462
CLEBSCH-GORDAN COEFFICIENTS
Interacting Boson approximation [DE85-003016] N85-33756
CLIMATE
Model projections of time-dependent response to increasing carbon dioxide [DE85-013326] N85-33641
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33865
The polar caps and the climatic evolution of Mars N85-33866
CLIMATOLOGY
Middle Atmosphere Program. Handbook for MAP, volume 11 [NASA-CR-176107] N85-33625
CLINICAL MEDICINE
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-85-018] N85-33660
Heavy ion medical accelerator options [DE85-011204] N85-33784
CLOCKS
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits [AD-D011731] N85-33298
CLOUD COVER
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
Repetition of dense cloud cover above Indian Ocean from generalized satellite data N85-33165
CLOUD PHOTOGRAPHY
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
CLOUDS
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979 [DE85-012060] N85-33638
Electrons and positrons from expanding supernova envelopes in dense clouds [OG-6.2-9] N85-34108
CLUTTER
Nonlinear filtration of clutter N85-33404
CMOS
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories [AERE-G-3368-PT-3] N85-33833
Transient two-dimensional simulation of SEU in a CMOS SRAM cell [DE85-008419] N85-34111
COAL
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream [DE85-011357] N85-33214
Drying of pulverized material with heated condensible vapor [DE85-011656] N85-33438
COAL DERIVED LIQUIDS
Superheated fuel injection for combustion of liquid-solid slurries [DE85-011624] N85-33266
COAL GASIFICATION
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry [DE85-010707] N85-33219
COAL UTILIZATION
Superheated fuel injection for combustion of liquid-solid slurries [DE85-011624] N85-33266
COASTAL WATER
Arctic and offshore research [DE85-001995] N85-33653
COATINGS
Management of Corrosion [AGARD-LS-141] N85-33238
Land vehicle corrosion management N85-33246
COAXIAL CABLES
Predicting electrical performance parameters of underwater cables N85-33391
COBALT COMPOUNDS
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate [DE85-010810] N85-33772
CODERS
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410
COEFFICIENTS
Hardware realization of digital filters without multipliers N85-33340
COHERENT RADAR
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324
COHERENT RADIATION
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
COLD WEATHER
Land vehicle corrosion management N85-33246
COLLAPSE
Neutrino-antineutrino annihilation around collapsing star [OG-1.1-10] N85-33911
COLLISION AVOIDANCE
System safety study of minimum TCAS 2 for instrument weather conditions [FAA/PM-85-12] N85-33113
COLLISION PARAMETERS
Polarization of fast particle beams by collisional pumping [DE85-011621] N85-33764
COLLISION RATES
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness [OEFZS-4312] N85-33762
COLLISIONAL PLASMAS
Recombination and ionization in a nitrogen plasma [AD-A155426] N85-33813
Collisional transport for a superthermal ion species in a plasma [DE85-011943] N85-33818
COLOR
Pulsed lasers for filming color holographic film images N85-33426
The development and evaluation of color display systems for airborne applications. Phase 1: Fundamental visual, perceptual, and display system considerations [FAA/PM-85-19] N85-33700
COLOR TELEVISION
LI481 and LI482 vidicons for two-tube color TV cameras with improved image quality N85-33333
COMBAT
A formulation and analysis of combat games [NASA-TP-2487] N85-33745
COMBUSTIBLE FLOW
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting [DE85-007493] N85-33203
Pressure correlations in turbulent reacting flows N85-33205
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211
Modeling of turbulent recirculating combusting flows N85-33212
COMBUSTION
Comments on two matters related to turbulent combustion N85-33204
Turbulent mixing and combustion N85-33207
Jet flows: Modelling and experiments N85-33208
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Vortex dynamics simulation of conserved scalar dissipation N85-33210
Combustion-deflagration-detonation transition in a confined spherical powder [ISL-R-108/84] N85-33223
Superheated fuel injection for combustion of liquid-solid slurries [DE85-011624] N85-33266
Development of a prototype energy meter [PB85-198430] N85-33476
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine [DE85-009850] N85-33502
COMBUSTION PHYSICS
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting [DE85-007493] N85-33203
Second order modelling in non-constant density flows N85-33206
Behavior of the porous bed in a combustion-deflagration-detonation transition [ISL-CO-220/84] N85-33224
Combustion-deflagration-detonation transition [ISL-CO-221/84] N85-33225
COMETARY ATMOSPHERES
Extended atmospheres of outer planet satellites and comets [NASA-CR-176137] N85-33648
COMFORT
Operator's functional comfort zone when controlling moving object N85-33670
COMMAND AND CONTROL
Study and realization of a command system adapted to space robotics [SNIAS-851-440-106] N85-33183
Assured information flow capping architecture [AD-A155392] N85-33283
COMMERCE
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843

COMMERCIAL AIRCRAFT
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114
COMMITTEE ON SPACE RESEARCH
The French space program N85-33127
COMMUNICATION
Adaptive corrector operating in frequency domain N85-33337
COMMUNICATION NETWORKS
Assured information flow capping architecture
[AD-A155392] N85-33283
Petcom: A software instrument for the analysis of Petri networks, oriented towards communication protocols
[FUB-50-1983] N85-33286
Research on distributed artificial intelligence
[AD-A155356] N85-33733
COMMUNICATION SATELLITES
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements
[AD-A155355] N85-33281
International prototype network in Dubna experimental satellite communications system N85-33383
COMPACTING
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
COMPANDING
Controllable companding in low-frequency FM radio communication systems N85-33402
COMPARISON
Fuel cell applications literature review
[DE85-011891] N85-33592
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
COMPENSATORS
Selectivity of weight compensator of passive interference to unknown velocities of detectable targets N85-33317
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
COMPILERS
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710
COMPONENT RELIABILITY
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516
Failure testing of active solar energy system components
[DE84-013024] N85-33561
COMPOSITE MATERIALS
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120
Dispersion toughened ceramic composites and method for making same
[DE85-011601] N85-33252
COMPOSITE STRUCTURES
Generation of round bores in composite structure railguns
[DE85-011872] N85-33501
COMPOSITION (PROPERTY)
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
Energy dependence of cosmic ray composition above 10(15) GeV/nucleus
[OG-5.4-4] N85-34081
The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34083
COMPRESSIBLE FLOW
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442
COMPRESSING
Design of electrooptical system with annular cathode and electrostatic compressor N85-33367
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
COMPTON EFFECT
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
COMPUTATION
System of microprocessor instructions N85-33362
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Report of Workshop on Computational Geometry and summary of related research
[AD-A155399] N85-33734
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808
COMPUTATIONAL FLUID DYNAMICS
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
COMPUTATIONAL GRIDS
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112
COMPUTER AIDED DESIGN
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
State of art and development problems in computer-aided design of electronic circuits N85-33342
Modeling of electronic circuits with high degree of component integration N85-33343
Adaptive modeling of electronic circuits N85-33345
Algorithms and organization of software for computer-aided circuit design N85-33347
System for computer-aided design of analog electronic circuits N85-33353
Algorithms for constructing models of circuit elements in input language of computer-aided design software N85-33356
IGES/RIM Parser/Converter users guide
[DE85-011965] N85-33716
User commands for product design and system management
[DE85-011708] N85-33721
A strategy planner for NASA robotics applications
[NASA-CR-175319] N85-33738
COMPUTER AIDED MANUFACTURING
IGES/RIM Parser/Converter users guide
[DE85-011965] N85-33716
COMPUTER AIDED MAPPING
Interactive procedures for discriminating and restoring contour line networks N85-33158
COMPUTER AIDED TOMOGRAPHY
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697
COMPUTER GRAPHICS
Interactive procedures for discriminating and restoring contour line networks N85-33158
Dialog system with minicomputer for plotting performance charts N85-33355
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
QKPLT users guide, version 2.0
[L-10094-M] N85-33707
IGES/RIM Parser/Converter users guide
[DE85-011965] N85-33716
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
COMPUTER NETWORKS
Some plant location problems — computer networks
[FUB-14-1984] N85-33746
COMPUTER PROGRAMMING
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411
Use of monitors in Pascal on the Lemur: A tutorial on the barrier, self-scheduling FOR-loop, and askfor monitors
[ANL-84-53] N85-33706
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710
AUTSKED: An addendum
[DE85-010410] N85-33712
Portable database driven control system for SPEAR
[DE85-010465] N85-33720
Flat is not necessarily good
[DE85-012819] N85-33723
How a BASIC program works
[DE85-009142] N85-33727
Microcomputer controlled image processor
[AD-D011734] N85-33735
Logical and physical modeling and design of scientific and statistical databases for energy research
[DE85-006081] N85-33737
COMPUTER PROGRAMS
Use of the computer programs PARA 80 to study results from firing the railgun ERGS-1M
[MRL-R-900] N85-33167
SHELTER: Description of a program code — indoor climate
[FOA-C5-85-0002-H1] N85-33278
Petcom: A software instrument for the analysis of Petri networks, oriented towards communication protocols
[FUB-50-1983] N85-33286
Introduction to adaptive techniques for voice signal processing
[FUB-52-1983] N85-33287
Algorithms and organization of software for computer-aided circuit design N85-33347
Software for frequency analysis of microwave circuits N85-33352
Optimization of radioelectronic circuits with software for modeling of integrated circuits on unified system computer N85-33354
Dialog system with minicomputer for plotting performance charts N85-33355
Algorithms for constructing models of circuit elements in input language of computer-aided design software N85-33356
Algorithm for determination of isomorphic graphs N85-33357
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
Developmental trends in radio receiver design N85-33407
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434
Machine intelligence for robotics applications
[DE85-011430] N85-33503
Electromagnetic inspection of wire ropes using sensor arrays
[AD-A155412] N85-33509
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
Electronic file system on an SM 90 minicomputer: The SARDE project
[ENST-84E018] N85-33705
QKPLT users guide, version 2.0
[L-10094-M] N85-33707
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709
AUTSKED: An addendum
[DE85-010410] N85-33712
Data Base Workshop: Availability-Reliability Modeling
[DE85-011570] N85-33713
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays
[DE85-012730] N85-33722
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
How a BASIC program works
[DE85-009142] N85-33727
Search of the VAXintosh customizing VMS V4.0 for DCL windows
[DE85-011306] N85-33729
A strategy planner for NASA robotics applications
[NASA-CR-175319] N85-33738
Electron and ion cyclotron heating calculations in the tandem-mirror
[DE85-011858] N85-33797
A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets
[AD-A155291] N85-33836
COMPUTER STORAGE DEVICES
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points
[NASA-CASE-MFS-25319-1] N85-33701
COMPUTER SYSTEMS DESIGN
Hardware realization of digital filters without multipliers N85-33340
Basic features of personal computers N85-33344
Algorithms and organization of software for computer-aided circuit design N85-33347
Software for frequency analysis of microwave circuits N85-33352

COMPUTER SYSTEMS PERFORMANCE
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739
COMPUTER SYSTEMS PROGRAMS
SHELTER: Description of a program code --- indoor climate
[FOA-C5-85-0002-H1] N85-33278
State of art and development problems in computer-aided design of electronic circuits N85-33342
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710
COMPUTER TECHNIQUES
Interactive procedures for discriminating and restoring contour line networks N85-33158
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
Signal processing in quasi-holographic system as an inverse problem N85-33315
Synthesis of tests for programmable logic arrays N85-33408
Detection of and search for faults in programmable logic arrays N85-33409
Computer science: Key to a space program renaissance. The 1981 NASA/ASEE summer study on the use of computer science and technology in NASA. Volume 2: Appendices
[NASA-CR-175295] N85-33702
Microcomputer controlled image processor
[AD-D011734] N85-33735
COMPUTERIZED SIMULATION
SHELTER: Description of a program code --- indoor climate
[FOA-C5-85-0002-H1] N85-33278
Modeling of electronic circuits with high degree of component integration N85-33343
Adaptive modeling of electronic circuits N85-33345
Computer simulation of integrated injection logic N85-33349
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
Calculation of external magnetic field of a shielded transformer N85-33373
Computer and water-model simulation of flow through poppet valves
[CFD/85/2] N85-33449
Lasertron simulation with a two-gap output cavity
[DE85-011213] N85-33480
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
Determination of DTL configurations
[DE85-010714] N85-33719
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
Numerical simulation of interior and terminal ballistics phenomena. Investigation of the effects of the parameters and application examples
[ISL-R-112/84] N85-33731
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739
Presentation of numerical simulation work in terminal ballistics using a few examples. Applications of the calculation model Program for Elastoplastic Simulation of Impacts (PEPSI) of the Franco-German Research Institute Saint Louis (ISL)
[ISL-CO-209/84] N85-33741
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
Transient two-dimensional simulation of SEU in a CMOS SRAM cell
[DE85-008419] N85-34111
COMPUTERS
Machine intelligence for robotics applications
[DE85-011430] N85-33503
Computer science: Key to a space program renaissance. The 1981 NASA/ASEE summer study on the use of computer science and technology in NASA. Volume 2: Appendices
[NASA-CR-175295] N85-33702
Integration of office automation within computing
[DE85-010021] N85-33736
CONCENTRATION (COMPOSITION)
Measurement of velocity and concentration in free jets
[ISL-CO-215/84] N85-33451
CONCRETE STRUCTURES
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265
Prestressed concrete vessel according to the hot liner concept: A critical evaluation of experimental results with a prototype vessel
[OEFZS-4313] N85-33550
CONCRETES
Hole cutting in building frames by laser
[FOA-C-20569-D9] N85-33487
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776
CONDUCTION BANDS
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
CONDUCTION ELECTRONS
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
CONFERENCES
Management of Corrosion
[AGARD-LS-141] N85-33238
Ninteenth Aerospace Mechanisms Symposium
[NASA-CP-2371] N85-33512
Nordic Association for Aerosol Research (NOSA) Aerosol Symposium: Program and abstracts
[FOA-E-40019] N85-33616
Proceedings of the 18th LAMPF Users Group Meeting
[DE85-011888] N85-33773
Terrestrial Planets: Comparative Planetology
[NASA-CR-176093] N85-33849
Ninteenth International Cosmic Ray Conference. Conference program and author index
[NASA-CP-2376] N85-33901
Ninteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
Ninteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
CONFIGURATION MANAGEMENT
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710
CONFINEMENT
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225
CONFORMAL MAPPING
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112
CONGRESSIONAL REPORTS
Acid rain in Europe
[COMMITTEE-PRINT-99-F] N85-33601
CONSTRUCTION
Deployable-erectable trade study for space station truss structures
[NASA-TM-87573] N85-33181
Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775
CONTAINERS
Latch assembly
[DE85-011660] N85-33492
CONTAINMENT
Explosive containment study
[DE85-011719] N85-33267
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766
CONTAMINATION
Soil extraction kit
[AD-D011736] N85-33190
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
CONTINUOUS RADIATION
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323
The cw operation of the FMIT RFQ accelerator
[DE85-012667] N85-33757
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
CONTINUOUS WAVE LASERS
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485
CONTOURS
Interactive procedures for discriminating and restoring contour line networks N85-33158
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
CONTROL EQUIPMENT
Dual optical mechanical position tracker
[AD-D011739] N85-33811
CONTROL MOMENT GYROSCOPES
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Application of traction drives as servo mechanisms N85-33520
CONTROL SIMULATION
Power density and threshold control strategies for radar track initiation
[AD-A155357] N85-33282
CONTROL STABILITY
Decentralized control of dynamically interconnected systems
[BU-111] N85-33744
CONTROL SYSTEMS DESIGN
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
Application of frequency domain handling qualities criteria to the longitudinal landing task
[NASA-TM-86728] N85-33124
The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
Portable database driven control system for SPEAR
[DE85-010465] N85-33720
CONTROL THEORY
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
Decentralized control of dynamically interconnected systems
[BU-111] N85-33744
CONTROL VALVES
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Computer and water-model simulation of flow through poppet valves
[CFD/85/2] N85-33449
CONTROLLABILITY
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
Application of frequency domain handling qualities criteria to the longitudinal landing task
[NASA-TM-86728] N85-33124
CONTROLLERS
An analysis of the effects of active solar energy system control sensor degradation on system performance
[DE84-013023] N85-33562
CONVECTION CURRENTS
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloquium
[PB85-188266] N85-33649
CONVERGENCE
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
Design of electrooptical system with annular cathode and electrostatic compressor N85-33367

Admissible convergence of Poisson integrals in symmetric spaces
[CTH-MATH-1985-04] N85-33750

COOLANTS
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802

COOLING SYSTEMS
Vortex generating flow passage design for increased film cooling effectiveness
[NASA-CASE-LEW-14039-1] N85-33433
On-line temperature sensor
[DE85-011641] N85-33465
Legionnaires' disease bacteria in power plant cooling systems: Phase 2
[DE85-011546] N85-33695

COORDINATES
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322

COPPER
Management of Corrosion
[AGARD-LS-141] N85-33238
Corrosion management strategies for aircraft and related systems N85-33239
Metal vapor lasers and their applications
[ISL-CO-218/84] N85-33488
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808

COPPER ALLOYS
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33306

COPPER SELENIDES
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576

CORE SAMPLING
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554

CORES
Induction motors with minimum waste of magnetic iron N85-33377

CORONAL LOOPS
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions
[NASA-CR-176090] N85-33897

CORRECTION
Microcomputer controlled image processor
[AD-D011734] N85-33735

CORRELATION
Digital matched filter N85-33339

CORROSION
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240
Maintenance and the military environment N85-33243
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244

CORROSION PREVENTION
Management of Corrosion
[AGARD-LS-141] N85-33238
Corrosion management strategies for aircraft and related systems N85-33239
Environmental factors in corrosion and deterioration of materials N85-33241
Rationale in the selection of corrosion protective coating systems N85-33242
Maintenance and the military environment N85-33243
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244
Protective systems and maintenance policies for marine environments N85-33245
Land vehicle corrosion management N85-33246
Relating corrosion maintenance to environmental factors N85-33247

CORROSION RESISTANCE
Management of Corrosion
[AGARD-LS-141] N85-33238
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240
Rationale in the selection of corrosion protective coating systems N85-33242
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765

CORROSION TESTS
Management of Corrosion
[AGARD-LS-141] N85-33238
Protective systems and maintenance policies for marine environments N85-33245

COS-B SATELLITE
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991

COSMIC GASES
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998

COSMIC RAY SHOWERS
Yakutsk Institute's cosmic ray research facility N85-33135
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920
Muon content of gamma ray induced EAS from Cygnus X-3
[OG-2.1-4] N85-33921
Gamma rays of energy or = 10(15) eV from Cyg X-3
[OG-2.1-5] N85-33922
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV
[OG-2.1-11] N85-33927
A search for gamma-ray point sources with the Carpet shower array
[OG-2.1-12] N85-33928
Cyg X-3: Not seen in high-energy gamma rays by COS-B
[OG-2.2-2] N85-33929
Constraints on cosmic-ray observation of Cygnus X-3
[OG-2.2-3] N85-33930
Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars
[OG-2.2-5] N85-33931
Relevance of the observation of UHE gammas to hard X-ray astronomy
[OG-2.2-6] N85-33932
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
Experimental results on gamma-ray sources at E sub 0 = 10(13) - 10(14) eV
[OG-2.2-12] N85-33937
Search for excess showers from Crab Nebula
[OG-2.3-2] N85-33939
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969
A search for sources of ultra high energy gamma rays at air shower energies with Ooty EAS array
[OG-2.6-8] N85-33970
Observations of potential ultra high energy gamma-ray sources above 10(15) eV
[OG-2.6-9] N85-33971
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
The 4U 0115+63: Another energetic gamma ray binary pulsar
[OG-2.6-11] N85-33973
Primary gamma-rays with E gamma or = to 10(15) eV: Evidence for ultrahigh energy particle acceleration in galactic sources
[OG-2.6-13] N85-33974
Search for the gamma-ray fluxes with energies above 10915) eV from various objects
[OG-2.6-14] N85-33975
Search for gamma-rays from M31 and other extragalactic objects
[OG-2.7-3] N85-33977
Some evidence for high energy gamma-ray sources at large galactic latitudes
[OG-2.7-5] N85-33978
Energy spectrum and arrival direction of primary cosmic rays of energy above 10 to the 18th power eV
[OG-5.1-1] N85-34043
Ultra high energy cosmic ray spectrum
[OG-5.1-2] N85-34044
The primary cosmic ray spectrum above 10 to the 19th power eV
[OG-5.1-3] N85-34045
New calorimetric all-particle energy spectrum
[OG-5.1-4] N85-34046
The muon content of EAS as a function of primary energy
[OG-5.1-8] N85-34050
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field
[OG-5.1-9] N85-34051
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
Cosmic ray spectra measurements at the Yakutsk EAS array
[OG-5.1-17] N85-34058
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34062
The primary composition beyond 10 to the 5th power GeV as deduced from high energy hadrons and muons in air showers
[OG-5.2-6] N85-34063
Implication of EAS data for the study of primary cosmic rays above 10 to the 5th power GeV
[OG-5.2-7] N85-34064
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
Anisotropy of cosmic rays of energy 10 (15) eV to 10 (17) eV observed at Akeno
[OG-5.3-3] N85-34070
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072
Arrival direction distribution of cosmic rays of energy 10 (18) eV
[OG-5.3-7] N85-34073
Observation of arrival times of EAS with energies or = 6 x 10 (14) eV
[OG-5.3-8] N85-34074
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075
Search for bursts in air shower data
[OG-5.3-10] N85-34076
Air shower arrival directions measured at Buckland Park
[OG-5.3-11] N85-34077
A simulation of high energy cosmic ray propagation 1
[OG-5.4-1] N85-34078
A simulation of high energy cosmic ray propagation 2
[OG-5.4-2] N85-34079

Cosmic rays in the 10(16) to 10(19) eV range from pulsars
[OG-5.4-3] N85-34080
Energy dependence of cosmic ray composition above 10(15) GeV/nucleus
[OG-5.4-4] N85-34081
Implications of the experimental results on high energy cosmic rays with regard to their origin
[OG-5.4-5] N85-34082
The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34083
UHE particle production in close binary systems
[OG-5.4-7] N85-34084
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34085
Modeling cosmic ray anisotropies near 10(18) eV
[OG-5.4-9] N85-34086
Anisotropy and the knee of the energy spectrum
[OG-5.4-10] N85-34087
Anisotropy of cosmic rays above 10(14) eV
[OG-5.4-11] N85-34088
A model for the proton spectrum and cosmic ray anisotropy
[OG-5.4-12] N85-34089
Interpretation of cosmic-ray anisotropy below 10(14) eV
[OG-5.4-13] N85-34090

COSMIC RAYS

Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833
Ninteenth International Cosmic Ray Conference. Conference program and author index
[NASA-CP-2376] N85-33901
Ninteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
Excess gamma-rays in the direction of the rho Ophiuchi cloud: An exotic object?
[OG-2.5-1] N85-33958
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
Cosmic gamma rays from quasars
[OG-2.7-10] N85-33983
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data
[OG-3.1-5] N85-33993
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002
Gamma ray line production from cosmic ray spallation reactions N85-34005
Ninteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
Source spectral index of heavy cosmic ray nuclei
[OG-4.1-2] N85-34008
Charge and energy dependence of the residence time of cosmic ray nuclei below 15 GeV/nucleon
[OG-4.1-3] N85-34009
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope
[OG-4.1-5] N85-34011
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-60 GeV/n
[OG-4.1-6] N85-34012
Relative abundances of elements (20 or = Z or = 28) at energies up to 70 GeV/amu using relativistic rise in ion chambers
[OG-4.1-7] N85-34013
Primary cosmic ray spectra in the range 20-60 GeV/n
[OG-4.1-9] N85-34015
Energy spectrum of cosmic-ray iron nucleus observed with emulsion chamber
[OG-4.1-10] N85-34016
Measurement of the iron spectrum from 60 to 200 GeV per nucleon
[OG-4.1-11] N85-34017
Cosmic ray nuclei of energy 50 GeV/NUC
[OG-4.1-12] N85-34018
Composition and energy spectra of cosmic ray nuclei above 500 GeV/nucleon from the JACEE emulsion chambers
[OG-4.1-13] N85-34019
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
[OG-4.2-2] N85-34022
Cosmic ray He-3 measurements
[OG-4.2-3] N85-34023
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
Galactic propagation models consistent with the cosmic ray lifetime derived from Be-10 measurements
[OG-4.3-1] N85-34026
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope
[OG-4.3-4] N85-34029
The isotopic composition of cosmic ray calcium
[OG-4.3-5] N85-34030
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
The energy dependence of the neon-22 excess in the cosmic radiation
[OG-4.3-7] N85-34032
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region 34 or = Z or = 48
[OG-4.4-3] N85-34036
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region Z or = 48
[OG-4.4-4] N85-34037
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3
[OG-4.4-5] N85-34038
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039
Capabilities of the LDEF-2 heavy nuclei collection
[OG-4.4-8] N85-34040
Ultraheavy cosmic ray tracks in meteorites: A reappraisal, based on calibrations with relativistic ions
[OG-4.4-10] N85-34041
Energy spectrum and arrival direction of primary cosmic rays of energy above 10 to the 18th power eV
[OG-5.1-1] N85-34043
Ultra high energy cosmic ray spectrum
[OG-5.1-2] N85-34044
The primary cosmic ray spectrum above 10 to the 19th power eV
[OG-5.1-3] N85-34045
A new measurement of the cosmic ray energy spectrum between 3 x 10 to the 15th power eV and 3 x 10 to the 16th power eV
[OG-5.1-6] N85-34048
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049
The muon contant of EAS as a function of primary energy
[OG-5.1-8] N85-34050
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34052
On galactic origin of cosmic rays with energy up to 10(19) eV
[OG-5.4-15] N85-34091
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
Search for heavy antinuclei in the cosmic radiation
[OG-6.1-2] N85-34093
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Antiparticles in the extragalactic cosmic radiation
[OG-6.1-8] N85-34099
Galactic cosmic ray antiprotons and supersymmetry
[OG-6.1-9] N85-34100
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
An observation of cosmic ray positrons from 10-20 GeV
[OG-6.2-6] N85-34105
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110
Transient two-dimensional simulation of SEU in a CMOS SRAM cell
[DE85-008419] N85-34111

COSMIC X RAYS

Balloon observations of hard X-rays from NGC 4151 and an X-ray transient source
[OG-2.7-6] N85-33979
CEN A observation at MeV-energies
[OG-2.7-7] N85-33980

COSMONAUTS

USSR report: Space
[JPRS-USP-84-006] N85-33128
Results and prospects of physiological research during spaceflights N85-33139

COSMOS SATELLITES

General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite N85-33579
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020

COST EFFECTIVENESS

Estimating optimum technical and economic indicators of data transmission systems N85-33406
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648

COST ESTIMATES

Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609

COST REDUCTION

Design improvements and cost reductions for a 5000 MWh superconducting Magnetic Energy Storage plant
[DE85-010572] N85-33830

COULOMB POTENTIAL

K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789

COUPLED MODES

Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485

COUPLING

A substructure coupling procedure applicable to general linear time-invariant dynamic systems
[NASA-CR-176144] N85-33542
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543

COUPLING COEFFICIENTS
Noise in stages and in interstage couplings of various transistor circuits N85-33334
Statistical analyses in the study of solar wind-magnetosphere coupling [DE85-009596] N85-33898
CRAB NEBULA
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Observations of the Crab Nebula at energies 4.10(11) [OG-2.3-1] N85-33938
Search for excess showers from Crab Nebula [OG-2.3-2] N85-33939
Very high energy gamma rays from the Crab Nebula [OG-2.3-3] N85-33940
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
Observation of hard X-rays from the Crab pulsar and A0535+26 [OG-2.3-7] N85-33944
Gamma rays of 0.3 to 30 MeV from PSR 0531+21 [OG-2.3-8] N85-33945
The 1000 GeV gamma ray emission from radio pulsars N85-33946
CRACK PROPAGATION
KRAK: A computer program for two-phase two-component porous flow and fracture [LA-9703] N85-33434
CRACKS
Automatic capability to store and retrieve component data and to calculate structural integrity of these components [DE85-012429] N85-33728
CRASH LANDING
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982 [PB85-910406] N85-33114
CRASHWORTHINESS
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane [NASA-TM-86738] N85-33123
CRATERING
Planetary surface processes: A review N85-33869
CRATERS
Impact processes and their implications for planetary formation and early evolution N85-33860
CRAY COMPUTERS
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer [DE85-013260] N85-33726
CREEP PROPERTIES
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids [DE85-011456] N85-33714
CREEP RUPTURE STRENGTH
Long-term strength of glass fibre/phenolic resin composites [NPL-DMA(A)-98] N85-33195
CRITICAL PATH METHOD
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits [AD-D011731] N85-33298
CROP GROWTH
Deficit irrigation feasibility study and demonstration project [DE85-011531] N85-33555
CROP IDENTIFICATION
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
CROSSTALK
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
On the principle of uniformity of satellite communications systems N85-33382
CRUDE OIL
AUTSKED: An addendum [DE85-010410] N85-33712
CRUSTAL FRACTURES
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
CRUSTS
Crustal development in the terrestrial planets N85-33879
CRYOGENICS
Cryogenic system for the University of Washington Superconducting Booster [DE85-010604] N85-33274
Evaluation study of mechanical refrigeration systems for application to space missions — infrared astronomy [SNIAS-1029ACA/LL/V] N85-33277
Partial discharges in and electric strength of high-voltage polymer insulation at cryogenic temperatures N85-33364
CRYOSTATS
Cryogenic system for the University of Washington Superconducting Booster [DE85-010604] N85-33274
CRYPTOGRAPHY
An algorithm for the generation of primitive polynomials [FUB-17-1984] N85-33730
CRYSTAL DEFECTS
Solid-melt interface studies of high-speed silicon sheet growth [NASA-CR-176112] N85-33249
CRYSTAL DISLOCATIONS
Solid-melt interface studies of high-speed silicon sheet growth [NASA-CR-176112] N85-33249
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
CRYSTAL GROWTH
New and revised methods of purifying mercuric iodide [DE85-011684] N85-33237
Solid-melt interface studies of high-speed silicon sheet growth [NASA-CR-176112] N85-33249
Stress and efficiency studies in EFG [NASA-CR-176125] N85-33251
Striation free doped silicon [AD-A155730] N85-33827
Apparatus and method for the horizontal, crucible-free growth of silicon sheet crystals [DE85-011588] N85-33829
CRYSTAL STRUCTURE
Striation free doped silicon [AD-A155730] N85-33827
CRYSTALLINITY
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells [NASA-CR-176109] N85-33571
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
CRYSTALS
Transparent electrode for optical switch [DE85-011618] N85-33310
Striation free doped silicon [AD-A155730] N85-33827
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4 [DE85-012968] N85-33831
CULTURE TECHNIQUES
Production of liquid fuels and chemicals by microalgae [DE85-008780] N85-33658
CURRENT DENSITY
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire [DE85-009966] N85-33308
CURRENT REGULATORS
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
CUTTERS
Portable cutting apparatus [DE85-011635] N85-33496
CUTTING
Hole cutting in building frames by laser [FOA-C-20569-D9] N85-33487
Portable cutting apparatus [DE85-011635] N85-33496
CYANIDES
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra [AERONOMICA-ACTA-A-295-1985] N85-33623
CYBERNETICS
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142
CYCLIC ACCELERATORS
High-power solid-state rf source for accelerator cavities [DE85-012672] N85-33309
CYCLIC HYDROCARBONS
Synthesis of 2,4,8,10-tetroxaspiro5,5undecane [NASA-CASE-ARC-11243-2] N85-33187
CYCLOTRON FREQUENCY
Analysis of Jovian decametric data: Study of radio emission mechanisms [NASA-CR-176057] N85-33846
CYCLOTRON RESONANCE
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1 [MPE-191] N85-34112
CYGNUS CONSTELLATION
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Search for gamma rays of energy 10(15) eV from Cygnus X-3 [OG-2.1-1] N85-33919
1000 GeV gamma rays from Cygnus X-3: An update [OG-2.1-8] N85-33925
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV [OG-2.1-11] N85-33927
A search for gamma-ray point sources with the Carpet shower array [OG-2.1-12] N85-33928
Cyg X-3: Not seen in high-energy gamma rays by COS-B [OG-2.2-2] N85-33929
Constraints on cosmic-ray observation of Cygnus X-3 [OG-2.2-3] N85-33930
Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars [OG-2.2-5] N85-33931
Relevance of the observation of UHE gammas to hard X-ray astronomy [OG-2.2-6] N85-33932
Low-energy gamma rays from Cygnus X-1 [OG-2.4-13] N85-33957
UHE particle production in close binary systems [OG-5.4-7] N85-34084
CYLINDRICAL ANTENNAS
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
CYLINDRICAL BODIES
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels [NASA-CR-176148] N85-33546

D

DAMAGE ASSESSMENT
Maintenance and the military environment N85-33243
Protective systems and maintenance policies for marine environments N85-33245
Relating corrosion maintenance to environmental factors N85-33247
DAMPERS (VALVES)
Dual clearance squeeze film damper [NASA-CASE-LEW-13506-1] N85-33490
DAMS
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting [AD-A155383] N85-33553
DATA ACQUISITION
Sensitivity and performance characterization of DINGU [DE85-010750] N85-33269
Conceptual design and analysis of high-speed electronic imaging [LA-10072-MS] N85-33292
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility [DE85-011402] N85-33609
Technology of off-gas treatment for liquid-fed ceramic melters [DE85-012467] N85-33610
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site [DE85-011209] N85-33611
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia [DE85-011835] N85-33657
DATA BASE MANAGEMENT SYSTEMS
IGES/RIM Parser/Converter users guide [DE85-011965] N85-33716
Automatic capability to store and retrieve component data and to calculate structural integrity of these components [DE85-012429] N85-33728
Technology transfer system automation implementation [PB85-177335] N85-33838
DATA BASES
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers [DE85-012960] N85-33613
Portable database driven control system for SPEAR [DE85-010465] N85-33720
Logical and physical modeling and design of scientific and statistical databases for energy research [DE85-006081] N85-33737

A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets
[AD-A155291] N85-33836

DATA COMPRESSION
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Electronic file system on an SM 90 minicomputer: The SARDE project
[ENST-84E018] N85-33705

DATA LINKS
Satellite links in the ISO architecture: Models and performance evaluation
[ENST-84E017] N85-33284

DATA MANAGEMENT
Report of Workshop on Computational Geometry and summary of related research
[AD-A155399] N85-33734

DATA PROCESSING
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709
Automatic capability to store and retrieve component data and to calculate structural integrity of these components
[DE85-012429] N85-33728
Report of Workshop on Computational Geometry and summary of related research
[AD-A155399] N85-33734

DATA RECORDING
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295

DATA REDUCTION
Search for bursts in air shower data
[OG-5.3-10] N85-34076

DATA RETRIEVAL
Technology transfer system automation implementation
[PB85-177335] N85-33838

DATA SAMPLING
The Mk.1 NPL digital sampling ac wattmeter
[NPL-DES-82] N85-33290

DATA TRANSMISSION
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Telemetry system for the transmission of data from projectiles during the acceleration phase in the gun barrel
[ISL-CO-207/84] N85-33178
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements
[AD-A155355] N85-33281
Estimating optimum technical and economic indicators of data transmission systems N85-33406
Developmental trends in radio receiver design N85-33407
Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429
IGES/RIM Parser/Converter users guide
[DE85-011965] N85-33716

DC 10 AIRCRAFT
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114

DECAMETRIC WAVES
Analysis of Jovian decametric data: Study of radio emission mechanisms
[NASA-CR-176057] N85-33846

DECISION MAKING
Search of the VAXintosh customizing VMS V4.0 for DCL windows
[DE85-011306] N85-33729

DECLINATION
Absolute measurement of Declination (D) by means of a proton magnetometer
[DMI-GEOPHYS-PAPERS-R-68] N85-33751

DECONTAMINATION
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191

DEEP WELL INJECTION (WASTES)
Office of Civilian Radioactive Waste Management
[DE85-012585] N85-33774

DEFINITION
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630

DEFLAGRATION
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225

DEFLECTION
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101

DEFORMATION
Microstructure-mechanical property relationships in the transformation-toughened ceramics
[DE85-011946] N85-33261
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions
[NASA-CR-176147] N85-33545
Crustal Dynamics Project: Catalogue of site information
[NASA-TM-86218] N85-33552
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
Discontinuous deformation analysis
[DE85-011208] N85-33628
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714

DEGASSING
Terrestrial Xe isotopic contraints on the early history of the Earth N85-33852

DEGRADATION
Induction motors with minimum waste of magnetic iron N85-33377

DEHUMIDIFICATION
Solid desiccant dehumidification systems for residential applications
[PB85-198489] N85-33279

DEICERS
Land vehicle corrosion management N85-33246

DELTAS
Mapping of dynamics of deltas by space photography N85-33163

DENSITY (MASS/VOLUME)
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374

DENSITY MEASUREMENT
Second order modelling in non-constant density flows N85-33206
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209

DEPLOYMENT
The Galeleo spacecraft magnetometer boom N85-33513
Hoop/column antenna deployment mechanism overview N85-33514
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539

DEPOSITION
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33626
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854
Late-stage planetesimals: How big? N85-33857

DEPTH MEASUREMENT
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055

DESALINIZATION
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194

DESICCANTS
Solid desiccant dehumidification systems for residential applications
[PB85-198489] N85-33279
Advances in open-cycle solid desiccant cooling
[DE85-008797] N85-33590

DESIGN ANALYSIS
Land vehicle corrosion management N85-33246
Optimization of radioelectronic circuits with software for modeling of integrated circuits on unified system computer N85-33354
Design of inductive shift transducers N85-33368
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771

DETECTION
Fire protection review revisit no. 2, Argonne National Laboratory, Argonne, Illinois
[DE85-013245] N85-33276
Probabilistic analysis of automatic control systems for detection systems N85-33335
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
Fiber optic moisture sensor
[DE85-011651] N85-33462
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694
Dual optical mechanical position tracker
[AD-D011739] N85-33811
Search for infrared counterparts of gamma-ray bursters
[OG-1.1-9] N85-33910
Gamma ray burst size-frequency distributions: Spectral selection effects
[OG-1.2-3] N85-33913

DETECTORS
The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072

DETERIORATION
Management of Corrosion
[AGARD-LS-141] N85-33238
Environmental factors in corrosion and deterioration of materials N85-33241
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244

DETONATION
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry
[ISL-R-109/84] N85-33226
Explosive containment study
[DE85-011719] N85-33267

DEUTERIUM
Preparation and use of very pure o-D2
[DE85-009415] N85-33800
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024

DEUTERIUM COMPOUNDS
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772

DEUTERONS
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096

DICTIONARIES
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591

DIELECTRIC PROPERTIES
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363
Application of field similitude theory to calculation of stripline heating N85-33419
Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
Multidiode integrated-circuit protective device N85-33425

DIELECTRICS
Radiation-hardened polymeric films
[DE85-011636] N85-33259
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Supermite vacuum interface design
[DE85-012661] N85-33759

DIFFERENTIAL EQUATIONS
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
Stochastic groundwater flow modeling using the second-order method
[DE85-011250] N85-33556
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer
[DE85-013260] N85-33726
Implementing linear multistep formulas for solving DAES
[DE85-012400] N85-33740

DIFFRACTION
Picosecond-pulse damage studies of diffraction gratings
[DE85-010785] N85-33481

DIFFUSE RADIATION
Nineteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
Cosmic gamma rays from quasars
[OG-2.7-10] N85-33983
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
Diffuse galactic annihilation radiation from supernova nucleosynthesis
[OG-3.2-8] N85-34004

DIFFUSION
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
A model for the proton spectrum and cosmic ray anisotropy
[OG-5.4-12] N85-34089

DIFFUSION FLAMES
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
Pressure correlations in turbulent reacting flows N85-33205
Vortex dynamics simulation of conserved scalar dissipation N85-33210

DIFFUSION WELDING
Prospective uses for diffusion welding in vacuum N85-33145
Welding methods for high melting metals N85-33508
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels
[NASA-TP-2480] N85-33537
Diffusion welding of Cassegrainian concentrator cell stack assemblies
[NASA-CR-176104] N85-33566

DIFFUSIVITY
Study of molecular diffusivity influence on mass transfer rate at a water-atmosphere interface N85-33222

DIFLUORIDES
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202

DIGITAL COMPUTERS
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410
CARE 3 MENU maintenance manual
[NASA-CR-172609] N85-33708

DIGITAL DATA
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33398
Digital tachometer N85-33416

DIGITAL FILTERS
Digital matched filter N85-33339
Hardware realization of digital filters without multipliers N85-33340
Design of high-order analog and digital filters with identical sections N85-33341
Design of digital bandpass filters with finite memory N85-33392
Maximally flat approximation of attenuation characteristics of coupled-line filters N85-33393
Miniature two-mode filters N85-33394
Method of designing digital band-pass filters with pulse response of finite duration N85-33395

DIGITAL NAVIGATION
Implementation of the SITAN algorithm in the digital terrain management and display system
[DE85-010659] N85-33115

DIGITAL SYSTEMS
Implementation of the SITAN algorithm in the digital terrain management and display system
[DE85-010659] N85-33115
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295
Characteristics of digital range finder with stroboscopic discretization N85-33319
Amplitude stabilization of pulse signals N85-33320
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Design of digital bandpass filters with finite memory N85-33392
Binary signal detection in acoustooptic receivers N85-33430
Transceiver test device
[AD-D011728] N85-33458
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822

DIGITAL TECHNIQUES
Interactive procedures for discriminating and restoring contour line networks N85-33158
The Mk.1 NPL digital sampling ac wattmeter
[NPL-DES-82] N85-33290
Design of digital bandpass filters with finite memory N85-33392
Hierarchical chamfer matching
[FOA-C-30387-E1] N85-33558

DIMENSIONLESS NUMBERS
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444

DIODES
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Multidiode integrated-circuit protective device N85-33425

DIPOLE ANTENNAS
Minimizing field scattered by slender dipoles N85-33388

DIPOLES
The magnetic field of planets N85-33891
What we have learned about the magnetic field of Mars N85-33892
Magnetic field generation in the cores of terrestrial bodies N85-33894

DIRECT CURRENT
Standard series of direct-current motors for regulated electric drives N85-33375
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376

DIRECTIONAL COUPLERS
Strongly coupled millimeter-band waveguide directional couplers N85-33418

DISCIPLINING
Rapid determination of cadet discipline by projective tests N85-33671

DISCRETE FUNCTIONS
Modeling of discrete devices with use of multivalued logic and nomograms N85-33351
Generalization of discrete Fourier transform for interpolation in time domain N85-33396
Generalization of discrete Fourier transformation for interpolation in time domain N85-33400

DISCRIMINANT ANALYSIS (STATISTICS)
Efficiency of discrimination in some invariant signal transformations N85-33399

DISCRIMINATION
Efficiency of discrimination in some invariant signal transformations N85-33399

DISK GALAXIES
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985
Interpretation of cosmic-ray anisotropy below 10(14) eV
[OG-5.4-13] N85-34090
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102

DISPERSIONS
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422

DISPLACEMENT MEASUREMENT
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474

DISPLAY DEVICES
Implementation of the SITAN algorithm in the digital terrain management and display system
[DE85-010659] N85-33115
Electrochromic display device
[AD-D011733] N85-33299
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300
Basic features of personal computers N85-33344
The development and evaluation of color display systems for airborne applications. Phase 1: Fundamental visual, perceptual, and display system considerations
[FAA/PM-85-19] N85-33700
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703

DISSIPATION
Vortex dynamics simulation of conserved scalar dissipation N85-33210
On the importance of viscous dissipation in Io N85-33873

DISTORTION
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
On the importance of viscous dissipation in Io N85-33873

DISTRIBUTION (PROPERTY)
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632
The distribution of compositional classes in the asteroid belt: A cosmochemical fingerprint? N85-33856
Relationships. between log N-log S and celestial distribution of gamma-ray bursts
[OG-1.2-10] N85-33918
A simulation of high energy cosmic ray propagation 2
[OG-5.4-2] N85-34079

DIVERTERS
Electrolytic cell
[DE85-011598] N85-33578

DOCUMENT STORAGE
Electronic file system on an SM 90 minicomputer: The SARDE project
[ENST-84E018] N85-33705

DOCUMENTS
Technology transfer system automation implementation
[PB85-177335] N85-33838

DOLOMITE (MINERAL)
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554

DONOR MATERIALS
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257

DOPED CRYSTALS
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
Trivalent cerium doped crystals as tunable laser systems: Two bad apples
[DE85-008168] N85-33482

DOPES
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
Radiation-hardened polymeric films
[DE85-011636] N85-33259
Experimental test for interpreting the increase in sensibility of doped CR-39
[OG-4.4-11] N85-34042

DOPPLER EFFECT
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985

DOSAGE
Beta response of selected instruments
[DE85-013278] N85-33469
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657

DOSIMETERS
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
Error evaluation in measurements with thermoluminescent dosimeters
[ISS-T-84/6] N85-33471
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822

DRAINAGE
Long-term exposure of (238) PuO2 to a terrestrial environment, volume 3
[DE85-011896] N85-33781

DRIFT (INSTRUMENTATION)
Recording small frequency drifts of microwave oscillators N85-33372

DRILLING
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
Lithology and stratigraphy of drill holes completed during 1984 in LANL use areas of Yucca Flat, Nevada Test Site, volume 6
[DE85-010695] N85-33631
Proposed resource evaluation plan. Salton Sea scientific drilling program
[DE85-011294] N85-33633

DRUMS (CONTAINERS)
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438

DRYING
The design and development of a spacecraft appendage tie down mechanism N85-33522

DRYING APPARATUS
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438

DUCTILITY
Metallic glass composition
[DE85-011594] N85-33253

DUCTS
Mechanical connection for a tubular assembly
[DE85-011590] N85-33497
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776

DURABILITY
Durability of oxygen sensors
[PB85-183093] N85-33477

DUST
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683

DYE LASERS
Pulsed lasers for filming color holographic film images N85-33426
Picosecond-pulse damage studies of diffraction gratings
[DE85-010785] N85-33481

DYNAMIC MODELS
Space robot simulator vehicle
[NASA-CR-176133] N85-33176

DYNAMIC PRESSURE
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121

DYNAMIC RESPONSE
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747

DYNAMIC STABILITY
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263

DYNAMIC STRUCTURAL ANALYSIS
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539
A substructure coupling procedure applicable to general linear time-invariant dynamic systems
[NASA-CR-176144] N85-33542
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543

DYNAMICAL SYSTEMS
Decentralized control of dynamically interconnected systems
[BU-111] N85-33744

DYNAMO THEORY
Magnetic field generation in the cores of terrestrial bodies N85-33894

DYNAMOMETERS
Durability of oxygen sensors
[PB85-183093] N85-33477

E

EARTH (PLANET)
Permafrost features on Earth and Mars: Similarities, differences N85-33870
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
Mineralogy and chemistry of the Earth N85-33877
Contrasts in evolution of Venus and Earth N85-33880
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884

EARTH ATMOSPHERE
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
A review of shock waves around aeroassisted orbital transfer vehicles
[NASA-TM-86769] N85-33177
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Terrestrial Planets: Comparative Planetology
[NASA-CR-176093] N85-33849
Terrestrial Xe isotopic contraints on the early history of the Earth N85-33852
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867

EARTH CRUST
Spacecraft-aided research discussed at geology Congress N85-33147
Noble gases in meteorites and terrestrial planets N85-33850

EARTH HYDROSPHERE
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863

EARTH MANTLE
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Noble gases in meteorites and terrestrial planets N85-33850
Terrestrial Xe isotopic contraints on the early history of the Earth N85-33852

EARTH MOVEMENTS
Mapping of dynamics of deltas by space photography N85-33163
Crustal Dynamics Project: Catalogue of site information
[NASA-TM-86218] N85-33552

EARTH OBSERVATIONS (FROM SPACE)
Cosmonauts participate in multilevel remote sensing experiment N85-33130
Physico-geographical regionalization of Caspian lowland based on space survey materials N85-33162

EARTH ORBITS
Procedure for estimating orbital debris risks
[NASA-TP-2507] N85-33169

EARTH PLANETARY STRUCTURE
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151

EARTH RESOURCES
Cosmonauts participate in multilevel remote sensing experiment N85-33130
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636

EARTH SURFACE
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155

EARTH-MOON SYSTEM
The coorbital hypothesis N85-33890
The magnetic field of planets N85-33891

EARTHQUAKES
Tectonic stability and expected ground motion at Yucca Mountain
[DE85-012004] N85-33629
Compressional environment in the location and orientation of planetary dorsa and terrestrial earthquake fault structures N85-33885

ECOLOGY
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
Model projections of time-dependent response to increasing carbon dioxide
[DE85-013326] N85-33641
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660

ECONOMIC ANALYSIS
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589

ECONOMIC DEVELOPMENT
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173
Federal export assistance programs applicable to the US photovoltaic industry
[NASA-CR-176114] N85-33841

ECONOMICS
Photovoltaics technical information guide
[DE85-002924] N85-33585

EDDINGTON APPROXIMATION
Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars
[OG-2.2-5] N85-33931

EDGE DISLOCATIONS
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Influence of edge effects on performance of electrooptical lens N85-33366

EDGES
Hierarchical chamfer matching
[FOA-C-30387-E1] N85-33558

EDUCATION
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640

EFFICIENCY
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer
[DE85-013260] N85-33726

EFFLUENTS
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606

The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609

EIGENVECTORS
Interacting Boson approximation
[DE85-003016] N85-33756

ELASTIC PLATES
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112

ELASTIC PROPERTIES
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions
[NASA-CR-176147] N85-33545
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714

ELASTIC WAVES
Numerical experiment of elastic wave propagation by framework model
[DRIC-T-7462] N85-33511

ELASTOPLASTICITY
A review of path-independent integrals in elastic-plastic fracture mechanics, task 4
[NASA-CR-174956] N85-33541

ELECTRIC BATTERIES
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588
Electric vehicle operations by the City of Huntsville, Alabama, March 1983 - May 1984
[DE85-005913] N85-33842

ELECTRIC BRIDGES
State of art and development problems in computer-aided design of electronic circuits N85-33342
Modeling of electronic circuits with high degree of component integration N85-33343
System for computer-sided design of analog electronic circuits N85-33353

ELECTRIC CHARGE
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363

ELECTRIC CONDUCTORS
Method and apparatus for casting conductive and semi-conductive materials
[DE85-011655] N85-33494

ELECTRIC CONTACTS
A rotating electrical transfer device N85-33529

ELECTRIC CURRENT
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Photothyristor optrons and optron microcircuits, part 1 N85-33424
Current enhancement in a conducting channel
[AD-A155418] N85-33812

ELECTRIC DISCHARGES
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
Safety characteristics of non-lithium battery systems
[AD-A155733] N85-33574

ELECTRIC FIELDS
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
New formulation for linear accelerator design
[DE85-011171] N85-33792
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
Interplanetary magnetic field control of high-latitude electric fields and currents determined from Greenland magnetometer data
[DMI-GEOPHYS-PAPERS-R-69] N85-33845

ELECTRIC GENERATORS
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators
[DE85-010627] N85-33230

ELECTRIC MOTOR VEHICLES
Electric vehicle operations by the City of Huntsville, Alabama, March 1983 - May 1984
[DE85-005913] N85-33842

ELECTRIC MOTORS
Standard series of direct-current motors for regulated electric drives N85-33375

ELECTRIC POTENTIAL
Recent advances in d-c relaxation techniques for the measurement of kinetics of fast electrode reactions
[DE85-005029] N85-33216
Transparent electrode for optical switch
[DE85-011618] N85-33310
IEA-SSPS CRS calibration report: Calibration of relevant measuring sensors
[DE85-010174] N85-33468
Surface voltage gradient role in high voltage solar array-plasma interaction: Center Director's discretionary fund
[NASA-TM-86516] N85-33567

ELECTRIC POWER PLANTS
Fuel cell applications literature review
[DE85-011891] N85-33592
Fusion facility siting considerations
[DE85-012894] N85-33805

ELECTRIC WIRE
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33308

ELECTRICAL ENGINEERING
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381

ELECTRICAL FAULTS
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313

ELECTRICAL INSULATION
Partial discharges in and electric strength of high-voltage polymer insulation at cryogenic temperatures N85-33364

ELECTRICAL MEASUREMENT
The measurement of high value resistances at the NPL — electrical resistance
[NPL-DES-81] N85-33291

ELECTRICAL RESISTANCE
The measurement of high value resistances at the NPL — electrical resistance
[NPL-DES-81] N85-33291

ELECTRICAL RESISTIVITY
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
Radiation-hardened polymeric films
[DE85-011636] N85-33259
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
Molten carbonate fuel cell separator
[DE85-011615] N85-33577

ELECTRICITY
Superconducting magnetic energy storage for asynchronous electrical systems
[DE85-005986] N85-33832

ELECTRO-OPTICAL EFFECT
Transparent electrode for optical switch
[DE85-011618] N85-33310

ELECTRO-OPTICS
Conceptual design and analysis of high-speed electronic imaging
[LA-10072-MS] N85-33292
Influence of edge effects on performance of electrooptical lens N85-33366
Design of electrooptical system with annular cathode and electrostatic compressor N85-33367
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483

ELECTROANESTHESIA
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687

ELECTROCHEMICAL CELLS
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity
[DE85-011602] N85-33258
Electrochemical methane sensor
[DE85-011663] N85-33464
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576

ELECTROCHEMICAL CORROSION
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240

ELECTROCHEMICAL MACHINING
Electrolytic cell
[DE85-011598] N85-33578

ELECTROCHROMISM
Electrochromic display device
[AD-D011733] N85-33299

ELECTRODES
Recent advances in d-c relaxation techniques for the measurement of kinetics of fast electrode reactions
[DE85-005029] N85-33216
Transparent electrode for optical switch
[DE85-011618] N85-33310
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
Electrochemical methane sensor
[DE85-011663] N85-33464
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576
Accelerator vibration issues
[DE85-010766] N85-33791

ELECTROLYSIS
Electrolytic cell
[DE85-011598] N85-33578

ELECTROLYTES
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576

ELECTROLYTIC CELLS
Electrolytic cell
[DE85-011598] N85-33578

ELECTROLYTIC POLARIZATION
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636

ELECTROMAGNETIC NOISE
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627

ELECTROMAGNETIC RADIATION
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715

ELECTROMAGNETIC SCATTERING
Minimizing field scattered by slender dipoles N85-33388

ELECTROMAGNETIC WAVE TRANSMISSION
Effects of hydrometeors on electromagnetic wave propagation
[AD-A155379] N85-33297

ELECTROMAGNETISM
Electromagnetic inspection of wire ropes using sensor arrays
[AD-A155412] N85-33509

ELECTRON BEAM WELDING
Welding methods for high melting metals N85-33508

ELECTRON BEAMS
Electron beam enhanced surface modification for making highly resolved structures
[DE85-011609] N85-33305
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794

ELECTRON CLOUDS
Excess gamma-rays in the direction of the rho Ophiuchi cloud: An exotic object?
[OG-2.5-1] N85-33958

ELECTRON CYCLOTRON HEATING
Electron and ion cyclotron heating calculations in the tandem-mirror
[DE85-011858] N85-33797
High-field launch electron cyclotron heating experiments in the ELMO Bumpy Torus
[DE85-012068] N85-33825
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834

ELECTRON DENSITY (CONCENTRATION)
Lithology and stratigraphy of drill holes completed during 1984 in LANL use areas of Yucca Flat, Nevada Test Site, volume 6
[DE85-010695] N85-33631

Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions
[NASA-CR-176090] N85-33897

ELECTRON DISTRIBUTION
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34062

ELECTRON ENERGY
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions
[NASA-CR-176090] N85-33897

ELECTRON FLUX DENSITY
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34062
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106

ELECTRON IRRADIATION
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615

ELECTRON MICROSCOPY
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697

ELECTRON PHOTON CASCADES
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054

ELECTRON SPIN
Polarization of fast particle beams by collisional pumping
[DE85-011621] N85-33764

ELECTRON TRAJECTORIES
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110

ELECTRON TUBES
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306

ELECTRONIC CONTROL
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119

ELECTRONIC EQUIPMENT
Adaptive modeling of electronic circuits N85-33345
Conferences of quantum-radiooptics section N85-33380

ELECTRONIC EQUIPMENT TESTS
Transceiver test device
[AD-D011728] N85-33458

ELECTRONIC FILTERS
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410

ELECTRONIC SPECTRA
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra
[OG-3.1-7] N85-33995

ELECTRONIC TRANSDUCERS
Design of inductive shift transducers N85-33368

ELECTRONICS
On the relationship between electronics and chemistry
[DRIC-T-7480] N85-33200
Modeling of electronic circuits with high degree of component integration N85-33343
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381

ELECTRONS
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109

ELECTROPHOTOMETERS
Program for observations of Halley's comet N85-33138

ELECTROPLATING
Laser-assisted solar cell metallization processing
[NASA-CR-176124] N85-33565
Electrolytic cell
[DE85-011598] N85-33578

ELECTROSTATIC PRECIPITATORS
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217

ELECTROSTATIC WAVES
Application of field similitude theory to calculation of stripline heating N85-33419

ELECTROSTATICS
Supermite vacuum interface design
[DE85-012861] N85-33759
Design status of heavy ion injector program
[DE85-010751] N85-33793

ELLIPTIC DIFFERENTIAL EQUATIONS
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739

EMISSION
The effect of anisotropic emission on the log N-log S curve of gamma-ray bursts
[OG-1.2-4] N85-33914

EMISSION SPECTRA
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra
[OG-3.1-7] N85-33995
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109

EMISSIVITY
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
Search for periodicities near 59 s in the COS-B gamma-ray data of 2CG195+04 (Geminga)
[OG-2.4-3] N85-33950
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954

ENERGETIC PARTICLES
Search for gamma-rays from M31 and other extragalactic objects
[OG-2.7-3] N85-33977
Cosmic rays in the 10(16) to 10(19) eV range from pulsars
[OG-5.4-3] N85-34080
The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34083

ENERGY
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948

ENERGY ABSORPTION
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515

ENERGY CONSERVATION
Energy efficient transport technology: Program summary and bibliography
[NASA-RF-1135] N85-33116

ENERGY CONSUMPTION
Development of a prototype energy meter
[PB85-198430] N85-33476

ENERGY CONVERSION EFFICIENCY
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564
Development of high-efficiency solar cells on silicon web
[NASA-CR-176101] N85-33568

ENERGY DISSIPATION
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056

ENERGY DISTRIBUTION
Influence of edge effects on performance of electrooptical lens N85-33366
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061

ENERGY GAPS (SOLID STATE)
Lasertron simulation with a two-gap output cavity
[DE85-011213] N85-33480

ENERGY LEVELS
Ionization detection of stimulated Raman spectra
[DE85-010572] N85-33218
Vacuum ultraviolet laser
[DE85-011632] N85-33478
Heavy quarks and CP: Moriond 1985
[DE85-010553] N85-33790

ENERGY POLICY
Fusion facility siting considerations
[DE85-012894] N85-33805
Magnetic Fusion Program plan
[DE85-009861] N85-33823

ENERGY SPECTRA
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU
[IFSI-85-2] N85-33844
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
Gamma ray burst size-frequency distributions: Spectral selection effects
[OG-1.2-3] N85-33913
Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947
On the 1983 observations of the gamma-ray source 2CG195+4
[OG-2.4-5] N85-33952
Low-energy gamma rays from Cygnus X-1
[OG-2.4-13] N85-33957
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
Nineteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
Source spectral index of heavy cosmic ray nuclei
[OG-4.1-2] N85-34008
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope
[OG-4.1-5] N85-34011
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
Primary cosmic ray spectra in the range 20-60 GeV/n
[OG-4.1-9] N85-34015
Energy spectrum of cosmic-ray iron nucleus observed with emulsion chamber
[OG-4.1-10] N85-34016
Measurement of the iron spectrum from 60 to 200 GeV per nucleon
[OG-4.1-11] N85-34017
Composition and energy spectra of cosmic ray nuclei above 500 GeV/nucleon from the JACEE emulsion chambers
[OG-4.1-13] N85-34019
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
Observations of ultraheavy cosmic ray particles at 10 GV cutoff rigidity
[OG-4.4-2] N85-34035

Energy spectrum and arrival direction of primary cosmic rays of energy above 10 to the 18th power eV
[OG-5.1-1] N85-34043
Ultra high energy cosmic ray spectrum
[OG-5.1-2] N85-34044
The primary cosmic ray spectrum above 10 to the 19th power eV
[OG-5.1-3] N85-34045
New calorimetric all-particle energy spectrum
[OG-5.1-4] N85-34046
Primary cosmic ray spectrum in the 10 to the 12th power - 10 to the 16th power eV energy range from the NUSEX experiment
[OG-5.1-5] N85-34047
A new measurement of the cosmic ray energy spectrum between 3 x 10 to the 15th power eV and 3 x 10 to the 16th power eV
[OG-5.1-6] N85-34048
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049
The muon content of EAS as a function of primary energy
[OG-5.1-8] N85-34050
A new method to determine the chemical composition of the cosmic rays beyond 10 to the 15th power eV
[OG-5.1-11] N85-34052
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
Cosmic ray spectra measurements at the Yakutsk EAS array
[OG-5.1-17] N85-34058
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061
The primary composition beyond 10 to the 5th power GeV as deduced from high energy hadrons and muons in air showers
[OG-5.2-6] N85-34063
Implication of EAS data for the study of primary cosmic rays above 10 to the 5th power GeV
[OG-5.2-7] N85-34064
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
Energy dependence of cosmic ray composition above 10(15) GeV/nucleus
[OG-5.4-4] N85-34081
Implications of the experimental results on high energy cosmic rays with regard to their origin
[OG-5.4-5] N85-34082
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34085
Anisotropy and the knee of the energy spectrum
[OG-5.4-10] N85-34087
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Antiparticles in the extragalactic cosmic radiation
[OG-6.1-8] N85-34099
Galactic cosmic ray antiprotons and supersymmetry
[OG-6.1-9] N85-34100
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103
An observation of cosmic ray positrons from 10-20 GeV
[OG-6.2-6] N85-34105
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109

ENERGY STORAGE
Transient two-dimensional simulation of SEU in a CMOS SRAM cell
[DE85-008419] N85-34111

ENERGY TECHNOLOGY
Arctic and offshore research
[DE85-001995] N85-33653
Logical and physical modeling and design of scientific and statistical databases for energy research
[DE85-006081] N85-33737
Federal export assistance programs applicable to the US photovoltaic industry
[NASA-CR-176114] N85-33841

ENERGY TRANSFER
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743

ENGINE NOISE
Experimental study of engine knock
[DE85-009851] N85-33268

ENGINE TESTS
Experimental study of engine knock
[DE85-009851] N85-33268

ENGINEERING DRAWINGS
Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595

ENTHALPY
Thermodynamic properties of alloys in the Fe-Ti system
[NPL-DMA(A)-96] N85-33229
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Enthalpy transients in fractured two-phase geothermal systems
[DE85-011988] N85-33587

ENTROPY
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867

ENVIRONMENT EFFECTS
Effects of environment on spacecraft materials N85-33144
Procedure for estimating orbital debris risks
[NASA-TP-2507] N85-33169
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589
Acid rain in Europe
[COMMITTEE-PRINT-99-F] N85-33601
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
Nordic Association for Aerosol Research (NOSA) Aerosol Symposium: Program and abstracts
[FOA-E-40019] N85-33616
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635
Meteorology and Society: Statements presented at the 9th congress under agenda item 12 — World Meteorological Organization
[WMO-643] N85-33644
Fusion facility siting considerations
[DE85-012894] N85-33805

ENVIRONMENT MODELS
Global environmental transport models for tritium
[DE85-011437] N85-33639
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854

ENVIRONMENT POLLUTION
Soil extraction kit
[AD-D011736] N85-33190

ENVIRONMENT PROTECTION
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765

ENVIRONMENTAL CHEMISTRY
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602

ENVIRONMENTAL MONITORING
Environmental factors in corrosion and deterioration of materials N85-33241
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloquium
[PB85-188266] N85-33649

ENVIRONMENTAL QUALITY
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696

ENVIRONMENTAL SURVEYS
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771

ENZYMES
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666

EPHEMERIS TIME
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954

EPITAXY
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828

EPITHELIUM
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686

EQUATIONS OF STATE
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434
Planetary fluids He and NH3 at high shock pressures and temperatures
[DE85-011851] N85-33896

EQUILIBRIUM EQUATIONS
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813

EQUIVALENT CIRCUITS
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378

ERROR ANALYSIS
Introduction to adaptive techniques for voice signal processing
[FUB-52-1983] N85-33287
Design of inductive shift transducers N85-33368
Error evaluation in measurements with thermoluminescent dosimeters
[ISS-T-84/6] N85-33471

ERROR CORRECTING DEVICES
Satellite links in the ISO architecture: Models and performance evaluation
[ENST-84E017] N85-33284
High-speed adaptation algorithm for harmonic corrector N85-33336

ERROR DETECTION CODES
Synthesis of tests for programmable logic arrays N85-33408
Detection of and search for faults in programmable logic arrays N85-33409

ERRORS
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411
Search of the VAXintosh customizing VMS V4.0 for DCL windows
[DE85-011306] N85-33729
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819

ERYTHROCYTES
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man
[NASA-TM-58268] N85-33693

ESTIMATES
Procedure for estimating orbital debris risks
[NASA-TP-2507] N85-33169
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413

ESTIMATING
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747
ETHERS
The use of perfluoroether lubricants in unprotected space environments N85-33523
EVALUATION
Photovoltaics technical information guide
[DE85-002924] N85-33585
Fuel cell applications literature review
[DE85-011891] N85-33592
EVAPORATION
Superheated fuel injection for combustion of liquid-solid slurries
[DE85-011624] N85-33266
Volatile loss following very large impacts N85-33862
EXCIMER LASERS
Sliding discharge in CO2 and excimer lasers N85-33379
EXERCISE PHYSIOLOGY
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
EXHAUST GASES
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream
[DE85-011357] N85-33214
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
EXOBIOLOGY
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
EXOTHERMIC REACTIONS
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
EXPERIMENTATION
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
EXPERT SYSTEMS
A strategy planner for NASA robotics applications
[NASA-CR-175319] N85-33738
EXPLOSIONS
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
EXPLOSIVES
Explosive containment study
[DE85-011719] N85-33267
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
Hydrazine nitrate based explosives
[ISL-CO-229/84] N85-33272
EXTINGUISHING
Vortex dynamics simulation of conserved scalar dissipation N85-33210
EXTRACTION
Soil extraction kit
[AD-D011736] N85-33190
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
EXTRAGALACTIC RADIO SOURCES
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
Search for TeV gamma rays from extragalactic sources and the Galactic Center
[OG-2.7-1] N85-33976
Search for gamma-rays from M31 and other extragalactic objects
[OG-2.7-3] N85-33977
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987
EXTRATERRESTRIAL RADIATION
Nineteenth International Cosmic Ray Conference. Conference program and author index
[NASA-CP-2376] N85-33901
EXTRAVEHICULAR ACTIVITY
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172

F

F-15 AIRCRAFT
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
FABRICATION
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495
Automatic rotary valve actuator
[DE65-012797] N85-33505
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564
FABRICS
Removable cleanable antireflection shield
[AD-D011735] N85-33810
FAILURE
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
FAILURE ANALYSIS
Methods of reliability design of semiconductor power devices N85-33365
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels
[NASA-CR-176148] N85-33546
Data Base Workshop: Availability-Reliability Modeling
[DE85-011570] N85-33713
FAIRINGS
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
FARM CROPS
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
FAST FOURIER TRANSFORMATIONS
Generalization of discrete Fourier transform for interpolation in time domain N85-33396
Generalization of discrete Fourier transformation for interpolation in time domain N85-33400
FASTENERS
Mechanical connection for a tubular assembly
[DE85-011590] N85-33497
Automatic capability to store and retrieve component data and to calculate structural integrity of these components
[DE85-012429] N85-33728
FATIGUE (MATERIALS)
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Fatigue behavior of chromium-containing ferritic steels at elevated temperature
[DE85-012309] N85-33231
Application of traction drives as servo mechanisms N85-33520
FATIGUE LIFE
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels
[NASA-TP-2480] N85-33537
FAULT TOLERANCE
A dual, fault-tolerant aerospace actuator N85-33530
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531
Modeling and measurement of fault-tolerant multiprocessors
[NASA-CR-3920] N85-33732
FEASIBILITY ANALYSIS
Deficit irrigation feasibility study and demonstration project
[DE85-011531] N85-33555
Diffusion welding of Cassegrainian concentrator cell stack assemblies
[NASA-CR-176104] N85-33566
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598
FEDERAL BUDGETS
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173
FEEDBACK AMPLIFIERS
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
FEEDBACK CONTROL
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
Decentralized control of dynamically interconnected systems
[BU-111] N85-33744
FELDSPARS
Primordial magmaspheres and their lasting consequences N85-33882
FERMENTATION
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659
FERRITIC STAINLESS STEELS
Fatigue behavior of chromium-containing ferritic steels at elevated temperature
[DE85-012309] N85-33231
FERROMAGNETIC MATERIALS
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
FERTILIZERS
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
FIBER OPTICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
Refraction of narrow probing light beam in multilayer optical fiber N85-33330
Temperature sensitivity of fiber-optic transmission line N85-33331
Fiber optic moisture sensor
[DE85-011651] N85-33462
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470
FIBER REINFORCED COMPOSITES
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions
[NASA-CR-176147] N85-33545
FIBERS
Woven heat exchanger
[DE85-011633] N85-33439
FIELD EFFECT TRANSISTORS
Evaluation of semiconductor devices for Electric and Hybrid Vehicle (EHV) ac-drive applications, volume 2
[NASA-CR-176103] N85-33294
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
FIGHTER AIRCRAFT
Maintenance and the military environment N85-33243
FILAMENT WINDING
Filament wound structures in PSP carbon composite
[RV10/84424] N85-33198
FILAMENTS
Current enhancement in a conducting channel
[AD-A155418] N85-33812
FILE MAINTENANCE (COMPUTERS)
CARE 3 MENU maintenance manual
[NASA-CR-172609] N85-33708
FILLING
Robotic order picking
[AD-D011737] N85-33493
AUTSKED: An addendum
[DE85-010410] N85-33712
FILM COOLING
Vortex generating flow passage design for increased film cooling effectiveness
[NASA-CASE-LEW-14039-1] N85-33433
FILMS
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
FILTRATION
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Nonlinear filtration of clutter N85-33404

FINES
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
FINITE DIFFERENCE THEORY
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
Selecting step sizes in sensitivity analysis by finite differences
[NASA-TM-86382] N85-33538
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays
[DE85-012730] N85-33722
FINITE ELEMENT METHOD
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Selecting step sizes in sensitivity analysis by finite differences
[NASA-TM-86382] N85-33538
Elevated temperature crack growth
[NASA-CR-174957] N85-33540
A review of path-independent integrals in elastic-plastic fracture mechanics, task 4
[NASA-CR-174956] N85-33541
Slideline verification for multilayer pressure vessels and piping analysis including strain hardening
[DE85-005816] N85-33549
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714
Numerical simulation of interior and terminal ballistics phenomena. Investigation of the effects of the parameters and application examples
[ISL-R-112/84] N85-33731
FIRE FIGHTING
Fire protection review revisit no. 2, Argonne National Laboratory, Argonne, Illinois
[DE85-013245] N85-33276
FIRE PREVENTION
Fire protection review revisit no. 2, Argonne National Laboratory, Argonne, Illinois
[DE85-013245] N85-33276
FISHES
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600
FISSION
Nuclear data for MCNP
[DE85-010794] N85-33782
FISSION PRODUCTS
Neutron detector counting capabilities for (10) B-lined and (235) U fission chambers in high gamma-ray fluxes
[DE85-011893] N85-33780
FLAME PROPAGATION
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine
[DE85-009850] N85-33502
FLAMES
Experimental study of engine knock
[DE85-009851] N85-33268
FLASH LAMPS
Switching power supply
[DE85-005993] N85-33312
FLASHOVER
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
FLAVOR (PARTICLE PHYSICS)
Heavy quarks and CP: Moriond 1985
[DE85-010553] N85-33790
FLEXIBILITY
Removable cleanable antireflection shield
[AD-D011735] N85-33810
FLIGHT CONTROL
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125
FLIGHT HAZARDS
System safety study of minimum TCAS 2 for instrument weather conditions
[FAA/PM-85-12] N85-33113
FLIGHT SIMULATION
The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125
FLIGHT SIMULATORS
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527
FLIGHT TESTS
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125
FLOODS
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting
[AD-A155383] N85-33553
FLOW DISTRIBUTION
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
Pressure correlations in turbulent reacting flows N85-33205
Second order modelling in non-constant density flows N85-33206
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434
FLOW MEASUREMENT
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450
Measurement of velocity and concentration in free jets
[ISL-CO-215/84] N85-33451
FLOW VISUALIZATION
Computer and water-model simulation of flow through poppet valves
[CFD/85/2] N85-33449
Experimental simulation of in-bore flows using a high pressure shock tube
[ISL-CO-217/84] N85-33452
Circulation control lift generation experiment: Hardware development N85-33535
FLOWMETERS
IEA-SSPS CRS calibration report: Calibration of relevant measuring sensors
[DE85-010174] N85-33468
FLUE GASES
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217
FLUID FLOW
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays
[DE85-012730] N85-33722
FLUID JETS
Supercritical fluid chromatography/supersonic jet spectroscopy
[DE85-007005] N85-33221
FLUIDIZED BED PROCESSORS
Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles
[PB85-187961] N85-33453
FLUORESCENCE
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
FLUORIDES
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
FLUORINATION
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
FLUORINE
Vacuum ultraviolet laser
[DE85-011632] N85-33478
FLUOROCARBONS
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802
FLUTTER ANALYSIS
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
FLUX (RATE)
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786
Observations of the Crab Nebula at energies 4.10(11)
[OG-2.3-1] N85-33938
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Balloon observations of hard X-rays from some galactic X-ray sources
[OG-2.5-11] N85-33966
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
Search for the gamma-ray fluxes with energies above 10915) eV from various objects
[OG-2.6-14] N85-33975
Cosmic rays in the 10(16) to 10(19) eV range from pulsars
[OG-5.4-3] N85-34080
The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34083
UHE particle production in close binary systems
[OG-5.4-7] N85-34084
Modeling cosmic ray anisotropies near 10(18) eV
[OG-5.4-9] N85-34086
FLUX DENSITY
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
On the 1983 observations of the gamma-ray source 2CG195+4
[OG-2.4-5] N85-33952
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001
The muon content of EAS as a function of primary energy
[OG-5.1-8] N85-34050
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061
Implication of EAS data for the study of primary cosmic rays above 10 to the 5th power GeV
[OG-5.2-7] N85-34064
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
FLY ASH
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217
FOILS (MATERIALS)
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363
FOLDS (GEOLOGY)
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
FOOD CHAIN
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691
FORBIDDEN TRANSITIONS
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218

FORMALDEHYDE
Synthesis of 2,4,8,10-tetroxaspiro5,5undecane [NASA-CASE-ARC-11243-2] N85-33187
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes [PB85-185585] N85-33194
Modeling of auto exhaust smog chamber data for EKMA development [PB85-186492] N85-33619
FOSSILS
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies [DE85-011962] N85-33636
FOURIER TRANSFORMATION
Adaptive corrector operating in frequency domain N85-33337
Substructure coupling in the frequency domain [NASA-CR-176140] N85-33543
FRACTIONATION
Supercritical fluid chromatography/supersonic jet spectroscopy [DE85-007005] N85-33221
Nebular volatile fractionations associated with chondrule formation N85-33855
FRACTURE MECHANICS
Relating corrosion maintenance to environmental factors N85-33247
Elevated temperature crack growth [NASA-CR-174957] N85-33540
A review of path-independent integrals in elastic-plastic fracture mechanics, task 4 [NASA-CR-174956] N85-33541
FRACTURE STRENGTH
Dispersion toughened ceramic composites and method for making same [DE85-011601] N85-33252
KRAK: A computer program for two-phase two-component porous flow and fracture [LA-9703] N85-33434
FRACTURES (MATERIALS)
Automatic capability to store and retrieve component data and to calculate structural integrity of these components [DE85-012429] N85-33728
FREE JETS
Measurement of velocity and concentration in free jets [ISL-CO-215/84] N85-33451
FREEZING
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982 [PB85-910406] N85-33114
Land vehicle corrosion management N85-33246
FRENCH SPACE PROGRAMS
The French space program N85-33127
FREQUENCIES
International prototype network in Dubna experimental satellite communications system N85-33383
Gradiental adaptive corrector with optimum tuning step N85-33403
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422
FREQUENCY DISTRIBUTION
Gamma ray burst size-frequency distributions: Spectral selection effects [OG-1.2-3] N85-33913
FREQUENCY MODULATION
Controllable companding in low-frequency FM radio communication systems N85-33402
Device for frequency modulation of a laser output spectrum [DE85-011634] N85-33479
FREQUENCY SHIFT
HEAO 3 upper limits to the expected 1634 KeV line from SS 483 [OG-2.4-9] N85-33954
Search for gamma ray lines from SS433 [OG-2.4-11] N85-33955
FREQUENCY SYNCHRONIZATION
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417
FREQUENCY SYNTHESIZERS
Design of high-order analog and digital filters with identical sections N85-33341
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417
FRICTION
The stress distribution in pin-loaded orthotropic plates [NASA-CR-176146] N85-33547
FRICTION DRAG
Drag-compensated, precision-powered hinge system N85-33517
FUEL CELLS
Integrated current collector and catalyst support [DE85-011616] N85-33311
Molten carbonate fuel cell separator [DE85-011615] N85-33577
Effects of H2S on molten carbonate fuel cells. Literature review on the impact of SO2 in the oxidant supplied to molten carbonate fuel cells [DE85-011698] N85-33586
Transfer of battery technology developed by the US Department of Energy [DE85-009868] N85-33588
Fuel cell applications literature review [DE85-011891] N85-33592
FUEL COMBUSTION
Jet flows: Modelling and experiments N85-33208
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream [DE85-011357] N85-33214
FUEL INJECTION
Superheated fuel injection for combustion of liquid-solid slurries [DE85-011624] N85-33266
FUEL SPRAYS
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays [DE85-012730] N85-33722
FUEL SYSTEMS
Special tools used by cosmonauts in EVA N85-33129
FUEL VALVES
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527
FUNCTION GENERATORS
Precision linear ramp function generator [DE85-011647] N85-33304
FUNCTIONAL DESIGN SPECIFICATIONS
Search of the VAXintosh customizing VMS V4.0 for DCL windows [DE85-011306] N85-33729
FURNACES
The design, construction and operation of a large-area, high-temperature, thermal conductance apparatus --- furnace insulation [NPL-DMA(A)-84] N85-33455
FUSELAGES
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle [NASA-TP-2467] N85-33107
FUSES (ORDNANCE)
Properties of Ti-6Al-4V spun formed fuze supports [DE85-011968] N85-33498
FUSION (MELTING)
Preparation and use of very pure o-D2 [DE85-009415] N85-33800
FUSION REACTORS
Fusion facility siting considerations [DE85-012894] N85-33805
Key issues of fusion nuclear technology development (FINESSE) [DE85-012599] N85-33817
Fusion Power Demonstration (FPD) maintenance and disassembly considerations [DE85-011413] N85-33820
Magnetic Fusion Program plan [DE85-009861] N85-33823
Blanket optimization studies for Cascade [DE85-010002] N85-33824

G

GALACTIC CLUSTERS
Further studies of X-ray structure of the Perseus cluster [OG-2.5-12] N85-33967
Cosmic gamma rays from quasars [OG-2.7-10] N85-33983
GALACTIC COSMIC RAYS
Diffuse galactic annihilation radiation from supernova nucleosynthesis [OG-3.2-8] N85-34004
GALACTIC EVOLUTION
Primary gamma-rays with E gamma or = to 10(15) eV: Evidence for ultrahigh energy particle acceleration in galactic sources [OG-2.6-13] N85-33974
Implications of the experimental results on high energy cosmic rays with regard to their origin [OG-5.4-5] N85-34082
Anisotropy of cosmic rays above 10(14) eV [OG-5.4-11] N85-34086
A model for the proton spectrum and cosmic ray anisotropy [OG-5.4-12] N85-34089
GALACTIC NUCLEI
Spectra and positions of galactic gamma-ray sources [OG-2.5-7] N85-33963
Search for TeV gamma rays from extragalactic sources and the Galactic Center [OG-2.7-1] N85-33976
Gamma-radiation with E gamma 5 MeV detected from Seyfert galaxy 3C120 and region with 1' = 190 deg and b' = 20 deg [OG-2.8-8] N85-33981
Galactic distribution of interstellar Al-26 [OG-3.2-3] N85-34002
Cosmic rays in the 10(16) to 10(19) eV range from pulsars [OG-5.4-3] N85-34080
Energy dependence of cosmic ray composition above 10(15) GeV/nucleus [OG-5.4-4] N85-34081
GALACTIC RADIATION
Galactic gamma-ray sources, SNOBs, and giant H2 regions [OG-2.5-4] N85-33961
Inverse-Compton gamma rays in the galaxy [OG-3.1-2] N85-33990
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data [OG-3.1-5] N85-33993
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra [OG-3.1-7] N85-33995
Relevance of cosmic gamma rays to the mass of gas in the galaxy [OG-3.1-8] N85-33996
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-80 GeV/n [OG-4.1-6] N85-34012
Cosmic ray nuclei of energy 50 GeV/NUC [OG-4.1-12] N85-34018
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays [OG-4.2-1] N85-34021
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983 [OG-4.2-2] N85-34022
Galactic propagation models consistent with the cosmic ray lifetime derived from Be-10 measurements [OG-4.3-1] N85-34026
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source [OG-4.3-2] N85-34027
The isotopic composition of cosmic ray chlorine [OG-4.3-3] N85-34028
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope [OG-4.3-4] N85-34029
The isotopic composition of cosmic ray calcium [OG-4.3-5] N85-34030
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data [OG-4.3-6] N85-34031
The energy dependence of the neon-22 excess in the cosmic radiation [OG-4.3-7] N85-34032
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region 34 or = Z or = 48 [OG-4.4-3] N85-34036
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region Z or = 48 [OG-4.4-4] N85-34037
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3 [OG-4.4-5] N85-34038
Capabilities of the LDEF-2 heavy nuclei collection [OG-4.4-8] N85-34040
Energy spectrum and arrival direction of primary cosmic rays of energy above 10 to the 18th power eV [OG-5.1-1] N85-34043
Ultra high energy cosmic ray spectrum [OG-5.1-2] N85-34044
The primary cosmic ray spectrum above 10 to the 19th power eV [OG-5.1-3] N85-34045
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV [OG-5.1-14] N85-34055
On galactic origin of cosmic rays with energy up to 10(19) eV [OG-5.4-15] N85-34091
Galactic cosmic ray antiprotons and supersymmetry [OG-6.1-9] N85-34100
GALACTIC ROTATION
A simulation of high energy cosmic ray propagation 2 [OG-5.4-2] N85-34079

GALAXIES
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
GALILEAN SATELLITES
Interpretation of photometric measurements of airless bodies N85-33871
GALILEO SPACECRAFT
The Galileo spacecraft magnetometer boom N85-33513
GALLIUM ARSENIDES
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
Diffusion welding of Cassegrainian concentrator cell stack assemblies
[NASA-CR-176104] N85-33566
GALLIUM PHOSPHIDES
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
GAME THEORY
A formulation and analysis of combat games
[NASA-TP-2487] N85-33745
GAMMA RAY ABSORPTIOMETRY
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
GAMMA RAY ABSORPTION
Observations of ultraheavy cosmic ray particles at 10 GV cutoff rigidity
[OG-4.4-2] N85-34035
GAMMA RAY ASTRONOMY
Ninteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
Experimental results on gamma-ray sources at E sub 0 = 10(13) - 10(14) eV
[OG-2.2-12] N85-33937
GAMMA RAY BEAMS
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
A search for gamma-ray point sources with the Carpet shower array
[OG-2.1-12] N85-33928
GAMMA RAY BURSTS
HEAO-1 observations of gamma ray bursts
[OG-1.1-1] N85-33903
Soft-spectrum gamma-ray bursts
[OG-1.1-2] N85-33904
Annihilation radiation in cosmic gamma-ray bursts
[OG-1.1-3] N85-33905
On the emission region of gamma ray bursts
[OG-1.1-4] N85-33906
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
Optical monitoring of gamma-ray source fields
[OG-1.1-7] N85-33908
Search for optical bursts from the gamma ray burst source GBS 0526-66
[OG-1.1-8] N85-33909
Search for infrared counterparts of gamma-ray bursters
[OG-1.1-9] N85-33910
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network
[OG-1.2-1] N85-33912
Gamma ray burst size-frequency distributions: Spectral selection effects
[OG-1.2-3] N85-33913
The effect of anisotropic emission on the log N-log S curve of gamma-ray bursts
[OG-1.2-4] N85-33914
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
An internally consistent gamma ray burst time history phenomenology
[OG-1.2-6] N85-33916
Gamma-ray burst variability above 4 MeV
[OG-1.2-7] N85-33917
Relationships between log N-log S and celestial distribution of gamma-ray bursts
[OG-1.2-10] N85-33918
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV
[OG-2.1-11] N85-33927
Cyg X-3: Not seen in high-energy gamma rays by COS-B
[OG-2.2-2] N85-33929
Relevance of the observation of UHE gammas to hard X-ray astronomy
[OG-2.2-6] N85-33932
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
Microburst of TeV gamma rays from the Crab pulsar
[OG-2.3-4] N85-33941
Secondary periodicities of microbursts of TeV gamma rays from the Crab pulsar
[OG-2.3-5] N85-33942
Search for bursts in air shower data
[OG-5.3-10] N85-34076
GAMMA RAY SPECTRA
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766
Gamma-ray line intensities for depleted uranium
[DE85-012674] N85-33804
Soft-spectrum gamma-ray bursts
[OG-1.1-2] N85-33904
The effect of anisotropic emission on the log N-log S curve of gamma-ray bursts
[OG-1.2-4] N85-33914
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
Low-energy gamma rays from Cygnus X-1
[OG-2.4-13] N85-33957
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
GAMMA RAY TELESCOPES
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
GAMMA RAYS
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission
[DE85-011659] N85-33454
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
Neutron detector counting capabilities for (10) B-lined and (235) U fission chambers in high gamma-ray fluxes
[DE85-011893] N85-33780
Use of gamma radiation as a form of preservation of sweet potatoes
[DE85-011998] N85-33787
Gamma-ray line intensities for depleted uranium
[DE85-012674] N85-33804
Ninteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Gamma rays of energy or = 10(15) eV from Cyg X-3
[OG-2.1-5] N85-33922
Experimental results on gamma-ray sources at E sub 0 = 10(13) - 10(14) eV
[OG-2.2-12] N85-33937
Observations of the Crab Nebula at energies 4.10(11)
[OG-2.3-1] N85-33938
Search for excess showers from Crab Nebula
[OG-2.3-2] N85-33939
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
The 1000 GeV gamma ray emission from radio pulsars N85-33946
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
Search for periodicities near 59 s in the COS-B gamma-ray data of 2CG195+04 (Geminga)
[OG-2.4-3] N85-33950
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
On the 1983 observations of the gamma-ray source 2CG195+4
[OG-2.4-5] N85-33952
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Excess gamma-rays in the direction of the rho Ophiuchi cloud: An exotic object?
[OG-2.5-1] N85-33958
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
A search in the COS-B data base for correlated time variability in regions containing objects of interest
[OG-2.5-9] N85-33964
Radio observations of four anticenter 2CG gamma-ray sources
[OG-2.5-10] N85-33965
Further studies of X-ray structure of the Perseus cluster
[OG-2.5-12] N85-33967
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
A search for sources of ultra high energy gamma rays at air shower energies with Ooty EAS array
[OG-2.6-8] N85-33970
Observations of potential ultra high energy gamma-ray sources above 10(15) eV
[OG-2.6-9] N85-33971
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
Primary gamma-rays with E gamma or = to 10(15) eV: Evidence for ultrahigh energy particle acceleration in galactic sources
[OG-2.6-13] N85-33974
Search for TeV gamma rays from extragalactic sources and the Galactic Center
[OG-2.7-1] N85-33976
Search for gamma-rays from M31 and other extragalactic objects
[OG-2.7-3] N85-33977
Some evidence for high energy gamma-ray sources at large galactic latitudes
[OG-2.7-5] N85-33978
CEN A observation at MeV-energies
[OG-2.7-7] N85-33980
Gamma-radiation with E gamma 5 MeV detected from Seyfert galaxy 3C120 and region with 1' = 190 deg and b' = 20 deg
[OG-2.8-8] N85-33981
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
Cosmic gamma rays from quasars
[OG-2.7-10] N85-33983
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990

Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data
[OG-3.1-5] N85-33993
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra
[OG-3.1-7] N85-33995
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003
Gamma ray line production from cosmic ray spallation reactions N85-34005
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field
[OG-5.1-9] N85-34051
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
Air shower arrival directions measured at Buckland Park
[OG-5.3-11] N85-34077
UHE particle production in close binary systems
[OG-5.4-7] N85-34084
Anisotropy of cosmic rays above 10(14) eV
[OG-5.4-11] N85-34088

GAS ANALYSIS
Experimental studies of glass refining
[NASA-CR-176130] N85-33248

GAS CHROMATOGRAPHY
Determination of organobromide compounds in water by gas chromatography-negative ion chemical ionisation mass spectrometry
[DRIC-T-7411] N85-33199

GAS COMPOSITION
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry
[ISL-R-109/84] N85-33226

GAS DENSITY
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data
[OG-3.1-5] N85-33993
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998

GAS DYNAMICS
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445

GAS EXPANSION
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959

GAS FLOW
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Vortex generating flow passage design for increased film cooling effectiveness
[NASA-CASE-LEW-14039-1] N85-33433

GAS GUNS
Low temperature experimental capability for use with gas guns
[DE85-010418] N85-33548

GAS IONIZATION
Relative abundances of elements (20 or = Z or = 28) at energies up to 70 GeV/amu using relativistic rise in ion chambers
[OG-4.1-7] N85-34013

GAS LASERS
Vacuum ultraviolet laser
[DE85-011632] N85-33478

GAS LUBRICANTS
Dual clearance squeeze film damper
[NASA-CASE-LEW-13506-1] N85-33490

GAS TURBINE ENGINES
Dual clearance squeeze film damper
[NASA-CASE-LEW-13506-1] N85-33490
Elevated temperature crack growth
[NASA-CR-174957] N85-33540

GAS-GAS INTERACTIONS
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434

GASDYNAMIC LASERS
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485

GASEOUS DIFFUSION
Study of molecular diffusivity influence on mass transfer rate at a water-atmosphere interface N85-33222
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557

GASES
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Excess gamma-rays in the direction of the rho Ophiuchi cloud: An exotic object?
[OG-2.5-1] N85-33958

GASOLINE
Durability of oxygen sensors
[PB85-183093] N85-33477

GASTROINTESTINAL SYSTEM
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674

GAUGE THEORY
Does low-energy physics depend on the potential of a heavy Higgs-particle
[NIKHEF-H/85-1] N85-33763

GAUSS EQUATION
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923

GEARS
Department of Energy gear drive unit final prototype testing and design evaluation
[DE85-003296] N85-33499
The design and development of a spacecraft appendage tie down mechanism N85-33522

GENERATION
Fuel cell applications literature review
[DE85-011891] N85-33592

GENETICS
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697

GEOCHEMISTRY
Geologic processes on Venus: An update N85-33883
Geochemical confirmation of the lunar magmasphere hypothesis N85-33895

GEODESY
Crustal Dynamics Project: Catalogue of site information
[NASA-TM-86218] N85-33552

GEODYNAMICS
Mapping of dynamics of deltas by space photography N85-33163

GEOIDS
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888

GEOLOGICAL FAULTS
Spacecraft-aided research discussed at geology Congress N85-33147
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636
Compressional environment in the location and orientation of planetary dorsa and terrestrial earthquake fault structures N85-33885

GEOLOGICAL SURVEYS
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636

GEOLOGY
Spacecraft-aided research discussed at geology Congress N85-33147
Tectonic stability and expected ground motion at Yucca Mountain
[DE85-012004] N85-33629
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634

GEOMAGNETIC TAIL
Magnetotails of the terrestrial planets: A comparative study N85-33875

GEOMAGNETISM
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
Absolute measurement of Declination (D) by means of a proton magnetometer
[DMI-GEOPHYS-PAPERS-R-68] N85-33751
Current enhancement in a conducting channel
[AD-A155418] N85-33812
Planetary surface processes: A review N85-33869
The magnetic field of planets N85-33891
Magnetic field generation in the cores of terrestrial bodies N85-33894
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899

GEOMETRY
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
Report of Workshop on Computational Geometry and summary of related research
[AD-A155399] N85-33734

GEOMORPHOLOGY
Geologic processes on Venus: An update N85-33883

GEOPHYSICS
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Questions about Mercury's role in comparative planetary geophysics N85-33861

GEOTHERMAL ENERGY EXTRACTION
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598

GEOTHERMAL ENERGY UTILIZATION
Pagosa Springs geothermal project
[DE85-011308] N85-33583
Enthalpy transients in fractured two-phase geothermal systems
[DE85-011988] N85-33587

GEOTHERMAL RESOURCES
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
Pagosa Springs geothermal project
[DE85-011308] N85-33583
Enthalpy transients in fractured two-phase geothermal systems
[DE85-011988] N85-33587
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Proposed resource evaluation plan. Salton Sea scientific drilling program
[DE85-011294] N85-33633

GERMANIUM ALLOYS
Development of improved thermoelectric materials for space nuclear power systems
[DE85-013079] N85-33807
GERMANIUM COMPOUNDS
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
GLARE
Removable cleanable antireflection shield
[AD-D011735] N85-33810
GLASS
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Experimental studies of glass refining
[NASA-CR-176130] N85-33248
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
GLASS COATINGS
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Laser sealed evacuated window glazings
[DE85-000512] N85-33273
GLASS FIBER REINFORCED PLASTICS
Long-term strength of glass fibre/phenolic resin composites
[NPL-DMA(A)-98] N85-33195
GLASS FIBERS
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
GLAZES
Laser sealed evacuated window glazings
[DE85-000512] N85-33273
GLIDERS
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
GLUONS
Quark structure of nuclei
[DE85-010781] N85-33795
GLYCINE
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674
GLYCOLS
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
GOALS
Long-term goals for solar thermal technology
[DE85-013032] N85-33597
GRADIENTS
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794
GRAIN BOUNDARIES
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
GRANULAR MATERIALS
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
GRAPHITE
Multistage spent particle collector and a method for making same
[NASA-CASE-LEW-13914-1] N85-33489
GRAPHITE-EPOXY COMPOSITES
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels
[NASA-CR-176148] N85-33546
GRAPHS (CHARTS)
Algorithm for determination of isomorphic graphs N85-33357
GRASSLANDS
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
GRATINGS (SPECTRA)
Picosecond-pulse damage studies of diffraction gratings
[DE85-010785] N85-33481
GRAVITY ANOMALIES
Geologic processes on Venus: An update N85-33883
The non-hydrostatic figures of the terrestrial planets N85-33887
GREENHOUSE EFFECT
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33865
Volatiles on satellites of the outer solar system N85-33868
GRINDING (COMMINUTION)
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
GROUND TRUTH
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
GROUND WATER
Stochastic groundwater flow modeling using the second-order method
[DE85-011250] N85-33556
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
GROUP VELOCITY
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422
GROUT
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263
GUN LAUNCHERS
Telemetry system for the transmission of data from projectiles during the acceleration phase in the gun barrel
[ISL-CO-207/84] N85-33178
Experimental simulation of in-bore flows using a high pressure shock tube
[ISL-CO-217/84] N85-33452

H

HADRONS
Generalized string amplitude and wave equation for hadrons
[DE85-011492] N85-33798
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
The primary composition beyond 10 to the 5th power GeV as deduced from high energy hadrons and muons in air showers
[OG-5.2-6] N85-34063
HALF SPACES
Numerical experiment of elastic wave propagation by framework model
[DRIC-T-7462] N85-33511
HALIDES
Metal vapor lasers and their applications
[ISL-CO-218/84] N85-33488
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
HALLEY'S COMET
Program for observations of Halley's comet N85-33138
HALOS
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103
HAMILTONIAN FUNCTIONS
Interacting Boson approximation
[DE85-003016] N85-33756
HANDBOOKS
Middle Atmosphere Program. Handbook for MAP, volume 11
[NASA-CR-176107] N85-33625
HARMONIC ANALYSIS
Hardy spaces and the L sup P-Neumann problem for Laplace's equation in a Lipschitz domain
[CTH-MATH-1985-02] N85-33749
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
Anisotropy of cosmic rays of energy 10 (15) eV to 10 (17) eV observed at Akeno
[OG-5.3-3] N85-34070
Anisotropy and the knee of the energy spectrum
[OG-5.4-10] N85-34087
HARMONIC CONTROL
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111
High-speed adaptation algorithm for harmonic corrector N85-33336
HARMONIC OSCILLATION
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
HARMONICS
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483
HARNESSES
Features of the solar array drive mechanism for the space telescope N85-33532
HAZARDS
Fire protection review revisit no. 2, Argonne National Laboratory, Argonne, Illinois
[DE85-013245] N85-33276
HEAD (ANATOMY)
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
HEALTH PHYSICS
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696
HEAO 1
HEAO-1 observations of gamma ray bursts
[OG-1.1-1] N85-33903
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
HEAO 3
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
HEART RATE
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142
HEAT EXCHANGERS
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
Woven heat exchanger
[DE85-011633] N85-33439
Heat-mass flow enhancement system for a metal hydride assembly
[DE85-010698] N85-33441
HEAT PUMPS
Solid state radiative heat pump
[DE85-011605] N85-33303
Heat-mass flow enhancement system for a metal hydride assembly
[DE85-010698] N85-33441
HEAT SINKS
Heat sinking for printed circuitry
[DE85-011585] N85-33440
HEAT SOURCES
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786
Contrasts in evolution of Venus and Earth N85-33880
HEAT TRANSFER
SHELTER: Description of a program code — indoor climate
[FOA-C5-85-0002-H1] N85-33278

TEMO and TEB thermoelectronic devices
N85-33415
Local heat-transfer measurements on a large, scale-model turbine blade airfoil using a composite of a heater element and liquid crystals
[NASA-TM-86900] N85-33435
Heat-mass flow enhancement system for a metal hydride assembly
[DE85-010698] N85-33441
Advances in open-cycle solid desiccant cooling
[DE85-008797] N85-33590
Microwave radiation and thermoregulation
[AD-A155718] N85-33654

HEAT TRANSFER COEFFICIENTS
Local heat-transfer measurements on a large, scale-model turbine blade airfoil using a composite of a heater element and liquid crystals
[NASA-TM-86900] N85-33435

HEAT TRANSMISSION
On the importance of viscous dissipation in Io
N85-33873
Adiabatic thermal models for planetary bodies
N85-33881
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959

HEAT TREATMENT
Maintenance and the military environment
N85-33243

HEATING
Development of a prototype energy meter
[PB85-198430] N85-33476

HEAVY IONS
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Heavy ion medical accelerator options
[DE85-011204] N85-33784
Design status of heavy ion injector program
[DE85-010751] N85-33793

HEAVY NUCLEI
Source spectral index of heavy cosmic ray nuclei
[OG-4.1-2] N85-34008
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3
[OG-4.4-5] N85-34038
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039
Capabilities of the LDEF-2 heavy nuclei collection
[OG-4.4-8] N85-34040
Ultraheavy cosmic ray tracks in meteorites: A reappraisal, based on calibrations with relativistic ions
[OG-4.4-10] N85-34041
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
Implications of the experimental results on high energy cosmic rays with regard to their origin
[OG-5.4-5] N85-34082

HELICAL FLOW
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU
[IFSI-85-2] N85-33844

HELIOSTATS
Theory of cellwise optimization for solar central receiver system
[DE85-012586] N85-33579

HELIUM
Tritium-helium effects in metals
[DE85-011507] N85-33235
Planetary fluids He and NH3 at high shock pressures and temperatures
[DE85-011851] N85-33896
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096

HELIUM ISOTOPES
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
[OG-4.2-2] N85-34022
Cosmic ray He-3 measurements
[OG-4.2-3] N85-34023
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097

HEMODYNAMIC RESPONSES
Formation of new microvessels in skeletal muscles of rats exposed to hypobaric hypoxia for one week
N85-33662

HEMODYNAMICS
Results and prospects of physiological research during spaceflights N85-33139
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station
N85-33141
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688

HETERODYNING
Recording small frequency drifts of microwave oscillators N85-33372
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753

HETEROJUNCTION DEVICES
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296

HETEROTROPHS
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691

HEXANITROSTILBENE
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270

HIERARCHIES
Hierarchical chamfer matching
[FOA-C-30387-E1] N85-33558
A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets
[AD-A155291] N85-33836

HIGH ALTITUDE
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions
N85-33665
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666

HIGH ALTITUDE PRESSURE
Formation of new microvessels in skeletal muscles of rats exposed to hypobaric hypoxia for one week
N85-33662
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663

HIGH ENERGY ELECTRONS
Low-energy gamma rays from Cygnus X-1
[OG-2.4-13] N85-33957
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106

HIGH ENERGY INTERACTIONS
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Primary gamma-rays with E gamma or = to 10(15) eV: Evidence for ultrahigh energy particle acceleration in galactic sources
[OG-2.6-13] N85-33974
Some evidence for high energy gamma-ray sources at large galactic latitudes
[OG-2.7-5] N85-33978
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34083

HIGH FREQUENCIES
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Transmitter spectrum analyzer N85-33389
Optimality criterion for high-frequency channel in receivers of discrete radio signals N85-33401
KT3127A, KT3128A transistors N85-33414

HIGH PRESSURE
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220

HIGH RESOLUTION
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218
Electron beam enhanced surface modification for making highly resolved structures
[DE85-011609] N85-33305
Determination of band oscillator strengths of atmospheric molecules from high resolution vacuum ultraviolet cross section measurements
[NASA-CR-176150] N85-33624
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956

HIGH REYNOLDS NUMBER
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209

HIGH SPEED PHOTOGRAPHY
Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles
[PB85-187961] N85-33453

HIGH STRENGTH STEELS
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551

HIGH TEMPERATURE
Fatigue behavior of chromium-containing ferritic steels at elevated temperature
[DE85-012309] N85-33231
Multistage spent particle collector and a method for making same
[NASA-CASE-LEW-13914-1] N85-33489
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802

HIGH TEMPERATURE NUCLEAR REACTORS
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802

HIGH TEMPERATURE PLASMAS
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907

HIGH TEMPERATURE TESTS
The design, construction and operation of a large-area, high-temperature, thermal conductance apparatus — furnace insulation
[NPL-DMA(A)-84] N85-33455

HIGH VACUUM
Prospective uses for diffusion welding in vacuum
N85-33145

HIGH VOLTAGES
Partial discharges in and electric strength of high-voltage polymer insulation at cryogenic temperatures
N85-33364

HINGES
Drag-compensated, precision-powered hinge system
N85-33517

HISTORIES
150 years of meteorology in Belgium N85-33642
An internally consistent gamma ray burst time history phenomenology
[OG-1.2-6] N85-33916

HOLOGRAPHIC INTERFEROMETRY
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474

Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753

HOLOGRAPHY
Signal processing in quasi-holographic system as an inverse problem N85-33315
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Depth dimension compression of 3-D images N85-33332
Pulsed lasers for filming color holographic film images N85-33426
Holographic cinematography with the help of a pulse YAG laser
[ISL-CO-213/84] N85-33472
Cineholography
[ISL-CO-214/84] N85-33473
Methods for the optical processing of signals
[DRIC-T-7439] N85-33809

HOMOGENEITY
On the principle of uniformity of satellite communications systems N85-33382

HOMOGENEOUS TURBULENCE
Vortex dynamics simulation of conserved scalar dissipation N85-33210

HOMOGENIZING
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376

HORMONE METABOLISMS
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681

HOT-FILM ANEMOMETERS
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121

HUBBLE CONSTANT
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987

HUBBLE SPACE TELESCOPE
Astron telescope stabilization system N85-33133
Features of the solar array drive mechanism for the space telescope N85-33532
Appendange deployment mechanism for the Hubble Spece Telescope program N85-33533

HUMAN BEHAVIOR
Rapid determination of cadet discipline by projective tests N85-33671
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694

HUMAN BEINGS
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man
[NASA-TM-58268] N85-33693

HUMAN FACTORS ENGINEERING
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
Speech analysis system for assessing pilots' working fitness N85-33661

HUMAN PERFORMANCE
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699

HUMAN REACTIONS
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607

HUMAN TOLERANCES
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605

HUMIDITY
Protective systems and maintenance policies for marine environments N85-33245
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650

HYBRID CIRCUITS
Modeling of electronic circuits with high degree of component integration N85-33343

HYDRAULIC FLUIDS
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635

HYDRAULIC JETS
Pulsed hydrojet propulsion
[DE85-010771] N85-33446

HYDRAZINE NITRATE
Hydrazine nitrate based explosives
[ISL-CO-229/84] N85-33272

HYDROCARBONS
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619

HYDRODYNAMICS
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376
Dual clearance squeeze film damper
[NASA-CASE-LEW-13506-1] N85-33490
Volatile loss following very large impacts N85-33862

HYDROELECTRIC POWER STATIONS
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589
Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595

HYDROELECTRICITY
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589

HYDROGEN
Thermophysical properties of fluids for the gas industry
[PB85-198471] N85-33227
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells
[NASA-CR-176109] N85-33571

HYDROGEN FUELS
Jet flows: Modelling and experiments N85-33208

HYDROGEN ISOTOPES
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
[OG-4.2-2] N85-34022

HYDROGEOLOGY
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636

HYDROLOGY
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting
[AD-A155383] N85-33553
Meteorology and Society: Statements presented at the 9th congress under agenda item 12 — World Meteorological Organization
[WMO-643] N85-33644

HYDROMETEOROLOGY
Effects of hydrometeors on electromagnetic wave propagation
[AD-A155379] N85-33297

HYDROSTATICS
Planetary reorientation by surface loads N85-33886

HYDROTHERMAL SYSTEMS
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636

HYPERFINE STRUCTURE
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236

HYPERSONIC AIRCRAFT
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle
[NASA-TP-2467] N85-33107

HYPERSONIC FLOW
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146

HYPERVELOCITY LAUNCHERS
Use of the computer programa PARA 80 to study results from firing the railgun ERGS-1M
[MRL-R-900] N85-33167

HYPERVELOCITY PROJECTILES
A method of accurizing rail guns
[LA-10028-MS] N85-33166

HYPOKINESIA
Results and prospects of physiological research during spaceflights N85-33139
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
Morphological study of antiorthostatic hypokinesia in monkeys N85-33680
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688

HYPOTHERMIA
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687

HYPOXIA
Formation of new microvessels in skeletal muscles of rats exposed to hypobaric hypoxia for one week N85-33662
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666

HYSTERESIS
Application of traction drives as servo mechanisms N85-33520

I

ICE FORMATION
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114
Permafrost features on Earth and Mars: Similarities, differences N85-33870

IDENTIFYING
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024

IGNEOUS ROCKS
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771

IGNITION SYSTEMS
Experimental study of engine knock
[DE85-009851] N85-33268

ILLUMINATING
Terrain illumination conditions when taking scanning photographs from space N85-33159
Electrochromic display device
[AD-D011733] N85-33299

ILLUSIONS
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672

IMAGE ENHANCEMENT
Quantizer of images of heat fields obtained by Rubin-type infra-red imagers N85-33369

IMAGE INTENSIFIERS
Quantizer of images of heat fields obtained by Rubin-type infra-red imagers N85-33369

IMAGE MOTION COMPENSATION
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474

IMAGE PROCESSING
Depth dimension compression of 3-D images N85-33332
Pulsed lasers for filming color holographic film images N85-33426
Hierarchical chamfer matching
[FOA-C-30387-E1] N85-33558
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
Microcomputer controlled image processor
[AD-D011734] N85-33735

IMAGE RECONSTRUCTION
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779

IMAGE RESOLUTION
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
IMAGES
Depth dimension compression of 3-D images N85-33332
LI481 and LI482 vidicons for two-tube color TV cameras with improved image quality N85-33333
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
IMAGING TECHNIQUES
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Physico-geographical regionalization of Caspian lowland based on space survey materials N85-33162
Conceptual design and analysis of high-speed electronic imaging
[LA-10072-MS] N85-33292
Quantizer of images of heat fields obtained by Rubin-type infra-red imagers N85-33369
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779
IMPACT
Volatile loss following very large impacts N85-33862
IMPACT ACCELERATION
Telemetry system for the transmission of data from projectiles during the acceleration phase in the gun barrel
[ISL-CO-207/84] N85-33178
IMPACT LOADS
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
IMPACT TESTS
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
IMPACTORS
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
IMPINGEMENT
Materials characterization with intense positron beams
[DE85-011850] N85-33769
IMPREGNATING
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265
IMPROVEMENT
Land vehicle corrosion management N85-33246
IMPURITIES
Cryogenic laser calorimetry for impurity analysis
[NASA-CR-176102] N85-33201
INCLUSIONS
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
INCOMPRESSIBLE FLOW
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112
INCOMPRESSIBLE FLUIDS
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
INDEPENDENT VARIABLES
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
INDEXES (DOCUMENTATION)
Ninteenth International Cosmic Ray Conference. Conference program and author index
[NASA-CP-2376] N85-33901
INDEXES (RATIOS)
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
INDIUM COMPOUNDS
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826
INDUCTANCE
Use of the computer programs PARA 80 to study results from firing the railgun ERGS-1M
[MRL-R-900] N85-33167
Predicting electrical performance parameters of underwater cables N85-33391
New formulation for linear accelerator design
[DE85-011171] N85-33792
INDUCTION MOTORS
Induction motors with minimum waste of magnetic iron N85-33377
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
INDUSTRIES
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843
INELASTIC COLLISIONS
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
INERT ATMOSPHERE
Apparatus and method for the horizontal, crucible-free growth of silicon sheet crystals
[DE85-011588] N85-33829
INERTIAL CONFINEMENT FUSION
Transparent electrode for optical switch
[DE85-011618] N85-33310
INFECTIOUS DISEASES
Legionnaires' disease bacteria in power plant cooling systems: Phase 2
[DE85-011546] N85-33695
INFESTATION
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
INFORMATION
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
INFORMATION FLOW
Assured information flow capping architecture
[AD-A155392] N85-33283
INFORMATION MANAGEMENT
A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets
[AD-A155291] N85-33836
INFORMATION RETRIEVAL
Technology transfer system automation implementation
[PB85-177335] N85-33838
INFORMATION SYSTEMS
Fuel cell applications literature review
[DE85-011891] N85-33592
INFRARED ASTRONOMY
Evaluation study of mechanical refrigeration systems for application to space missions --- infrared astronomy
[SNIAS-1029ACA/LL/V] N85-33277
Mosaic Infrared Sensor for Space Astronomy (MIRSSA)
[NASA-CR-176154] N85-33456
INFRARED DETECTORS
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
Mosaic Infrared Sensor for Space Astronomy (MIRSSA)
[NASA-CR-176154] N85-33456
INFRARED IMAGERY
Quantizer of images of heat fields obtained by Rubin-type infra-red imagers N85-33369
INFRARED PHOTOGRAPHY
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
INFRARED RADIATION
Solid state radiative heat pump
[DE85-011605] N85-33303
Search for infrared counterparts of gamma-ray bursters
[OG-1.1-9] N85-33910
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
Further studies of X-ray structure of the Perseus cluster
[OG-2.5-12] N85-33967
INFRARED SPECTRA
Voigt line profile computation of infrared lines in the stratosphere and mesosphere
[AERONOMICA-ACTA-A-294-1985] N85-33622
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra
[AERONOMICA-ACTA-A-295-1985] N85-33623
INHOMOGENEITY
Vortex dynamics simulation of conserved scalar dissipation N85-33210
INITIATION
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
INJECTION
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Computer simulation of integrated injection logic N85-33349
INJECTORS
Design status of heavy ion injector program
[DE85-010751] N85-33793
INKS
Ink jet printing of silver metallization for photovoltaics
[NASA-CR-176054] N85-33569
INSECTS
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
INSPECTION
Corrosion management strategies for aircraft and related systems N85-33239
Relating corrosion maintenance to environmental factors N85-33247
INSTRUCTION SETS (COMPUTERS)
System of microprocessor instructions N85-33362
INSTRUMENT COMPENSATION
Development of a prototype energy meter
[PB85-198430] N85-33476
INSULATION
Induction motors with minimum waste of magnetic iron N85-33377
INTEGRAL EQUATIONS
Some properties of Loeb-Sobolev spaces
[CTH-MATH-1985-01] N85-33748
INTEGRALS
Admissible convergence of Poisson integrals in symmetric spaces
[CTH-MATH-1985-04] N85-33750
INTEGRATED CIRCUITS
Adaptive modeling of electronic circuits N85-33345
Software for frequency analysis of microwave circuits N85-33352
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33361
Multidiode integrated-circuit protective device N85-33425
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
INTERATOMIC FORCES
Planetary fluids He and NH3 at high shock pressures and temperatures
[DE85-011851] N85-33896
INTERFACES
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
Module for interfacing microprocessors and microcomputer N85-33390
Supermite vacuum interface design
[DE85-012861] N85-33759
INTERFEROMETERS
Automatic sphericity interferometer for testing lens radii
[AD-A155736] N85-33457
INTERGALACTIC MEDIA
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102
INTERIOR BALLISTICS
Telemetry system for the transmission of data from projectiles during the acceleration phase in the gun barrel
[ISL-CO-207/84] N85-33178
Experimental simulation of in-bore flows using a high pressure shock tube
[ISL-CO-217/84] N85-33452
Numerical simulation of interior and terminal ballistics phenomena. Investigation of the effects of the parameters and application examples
[ISL-R-112/84] N85-33731
INTERNATIONAL COOPERATION
International prototype network in Dubna experimental satellite communications system N85-33383
INTERNATIONAL SUN EARTH EXPLORER 3
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
[OG-4.2-2] N85-34022
INTERNATIONAL TRADE
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
Federal export assistance programs applicable to the US photovoltaic industry
[NASA-CR-176114] N85-33841

INTERPLANETARY FLIGHT
Far travelers: The exploring machines
[NASA-SP-480] N85-33126
INTERPLANETARY MAGNETIC FIELDS
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU
[IFSI-85-2] N85-33844
Interplanetary magnetic field control of high-latitude electric fields and currents determined from Greenland magnetometer data
[DMI-GEOPHYS-PAPERS-R-69] N85-33845
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899
INTERPLANETARY SPACECRAFT
Far travelers: The exploring machines
[NASA-SP-480] N85-33126
INTERPOLATION
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753
INTERPROCESSOR COMMUNICATION
Parallel Cholesky factorization in message-passing multiprocessor environments
[DE85-012079] N85-33717
INTERSTELLAR MAGNETIC FIELDS
A simulation of high energy cosmic ray propagation 1
[OG-5.4-1] N85-34078
Modeling cosmic ray anisotropies near 10(18) eV
[OG-5.4-9] N85-34086
On galactic origin of cosmic rays with energy up to 10(19) eV
[OG-5.4-15] N85-34091
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110
INTERSTELLAR MATTER
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002
Interpretation of cosmic-ray anisotropy below 10(14) eV
[OG-5.4-13] N85-34090
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
INTERSTELLAR RADIATION
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
INTERVALS
Precision microwave attenuation measurement by time interval ratio
[RSRE-85005] N85-33280
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
INVERSE SCATTERING
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
INVISCID FLOW
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112
IO
On the importance of viscous dissipation in Io
N85-33873
Models of planetary structure and evolution: The case of Io N85-33874
IODIDES
New and revised methods of purifying mercuric iodide
[DE85-011684] N85-33237
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576
IODINE
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
ION ACCELERATORS
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Heavy ion medical accelerator options
[DE85-011204] N85-33784
ION BEAMS
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Heavy ion medical accelerator options
[DE85-011204] N85-33784
Design status of heavy ion injector program
[DE85-010751] N85-33793
ION CHARGE
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
ION DENSITY (CONCENTRATION)
Yakutsk Institute's cosmic ray research facility
N85-33135
ION EXCHANGE RESINS
Polyethylene solidification of low-level wastes
[DE85-012568] N85-33799
ION EXCHANGING
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
ION IMPLANTATION
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells
[NASA-CR-176109] N85-33571
ION INJECTION
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Design status of heavy ion injector program
[DE85-010751] N85-33793
ION PLATING
Advances in sputtered and ion plated solid film lubrication N85-33524
ION SOURCES
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
IONIZATION
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218
IONIZATION CHAMBERS
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822
Relative abundances of elements (20 or = Z or = 28) at energies up to 70 GeV/amu using relativistic rise in ion chambers
[OG-4.1-7] N85-34013
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
IONIZATION CROSS SECTIONS
Charge and energy dependence of the residence time of cosmic ray nuclei below 15 GeV/nucleon
[OG-4.1-3] N85-34009
IONIZING RADIATION
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
IONOSPHERE
Yakutsk Institute's cosmic ray research facility
N85-33135
Magnetotails of the terrestrial planets: A comparative study N85-33875
IONS
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
IRON
Tritium-helium effects in metals
[DE85-011507] N85-33235
Induction motors with minimum waste of magnetic iron
N85-33377
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models
N85-33854
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-60 GeV/n
[OG-4.1-6] N85-34012
Energy spectrum of cosmic-ray iron nucleus observed with emulsion chamber
[OG-4.1-10] N85-34016
Measurement of the iron spectrum from 60 to 200 GeV per nucleon
[OG-4.1-11] N85-34017
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
IRON ALLOYS
Metallic glass composition
[DE85-011594] N85-33253
IRRADIATION
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
IRRIGATION
Deficit irrigation feasibility study and demonstration project
[DE85-011531] N85-33555
ISENTROPIC PROCESSES
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
ISOLATION
Molten carbonate fuel cell separator
[DE85-011615] N85-33577
ISOMORPHISM
Algorithm for determination of isomorphic graphs
N85-33357
ISOTHERMAL FLOW
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211
ISOTHERMAL PROCESSES
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
ISOTOPES
Ninteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope
[OG-4.3-4] N85-34029
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039
ISOTOPIC LABELING
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
ISOTROPY
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
ISRAEL
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598

J

J INTEGRAL
A review of path-independent integrals in elastic-plastic fracture mechanics, task 4
[NASA-CR-174956] N85-33541
JANUS REACTOR
Microdosimetric spectra measurements of JANUS neutrons
[DE85-012108] N85-33801
JET ENGINES
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527
JET FLOW
Second order modelling in non-constant density flows N85-33206
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
JETTISON SYSTEMS
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
JOINTS (JUNCTIONS)
Mechanical connection for a tubular assembly
[DE85-011590] N85-33497
The stress distribution in pin-loaded orthotropic plates
[NASA-CR-176146] N85-33547
JOURNALS
NBS (National Bureau of Standards) library serial holdings, 1985
[PB85-191948] N85-33839
JUNCTION TRANSISTORS
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
JUPITER (PLANET)
The coorbital hypothesis N85-33890
JUPITER SATELLITES
The coorbital hypothesis N85-33890

K

KAONS
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789
KEROSENE
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376
KINETIC ENERGY
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloguium
[PB85-188266] N85-33649
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
KINETIC EQUATIONS
Collisional transport for a superthermal ion species in a plasma
[DE85-011943] N85-33818
KITS
Robotic order picking
[AD-D011737] N85-33493
KONDO EFFECT
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
KRYPTON 85
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607

L

LABOR
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
LABORATORIES
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847
LAGRANGE COORDINATES
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442
LAGRANGE MULTIPLIERS
Model building and practical aspects of nonlinear programming
[AD-A155720] N85-33711
LAND USE
Cosmonauts participate in multilevel remote sensing experiment N85-33130
LANDING SITES
Mars landing sites N85-33893
LAPLACE TRANSFORMATION
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543
LARGE SCALE INTEGRATION
Modeling of electronic circuits with high degree of component integration N85-33343
Algorithms and organization of software for computer-aided circuit design N85-33347
Computer simulation of integrated injection logic N85-33349
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
LARGE SPACE STRUCTURES
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180
LARVAE
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691
LASER APPLICATIONS
Cryogenic laser calorimetry for impurity analysis
[NASA-CR-176102] N85-33201
Jet flows: Modelling and experiments N85-33208
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Laser sealed evacuated window glazings
[DE85-000512] N85-33273
Transparent electrode for optical switch
[DE85-011618] N85-33310
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483
Laser effects on opaque targets. Part 2C: Thermal effects of a time-variable beam intensity
[ISL-R-105/84-PT-2C] N85-33486
Hole cutting in building frames by laser
[FOA-C-20569-D9] N85-33487
Laser-assisted solar cell metallization processing
[NASA-CR-176124] N85-33565
LASER CAVITIES
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483
LASER DOPPLER VELOCIMETERS
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450
Measurement of velocity and concentration in free jets
[ISL-CO-215/84] N85-33451
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine
[DE85-009850] N85-33502
LASER FUSION
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483
LASER HEATING
Laser effects on opaque targets. Part 2C: Thermal effects of a time-variable beam intensity
[ISL-R-105/84-PT-2C] N85-33486
LASER OUTPUTS
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Sliding discharge in CO2 and excimer lasers N85-33379
Device for frequency modulation of a laser output spectrum
[DE85-011634] N85-33479
Lasertron simulation with a two-gap output cavity
[DE85-011213] N85-33480
Picosecond-pulse damage studies of diffraction gratings
[DE85-010785] N85-33481
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
Microcomputer controlled image processor
[AD-D011734] N85-33735
LASER SPECTROMETERS
Cryogenic laser calorimetry for impurity analysis
[NASA-CR-176102] N85-33201
LASER SPECTROSCOPY
Rapid analysis of steels using laser-based techniques
[DE85-010747] N85-33232
LASER TARGET INTERACTIONS
Laser effects on opaque targets. Part 2C: Thermal effects of a time-variable beam intensity
[ISL-R-105/84-PT-2C] N85-33486
LASERS
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
Pulsed lasers for filming color holographic film images N85-33426
Metal vapor lasers and their applications
[ISL-CO-218/84] N85-33488
LATCH-UP
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833
LATCHES
Latch assembly
[DE85-011660] N85-33492
LATITUDE
Some evidence for high energy gamma-ray sources at large galactic latitudes
[OG-2.7-5] N85-33978
LATTICE PARAMETERS
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
LAUNCH VEHICLES
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
LEACHING
AUTSKED: An addendum
[DE85-010410] N85-33712
LEAD (METAL)
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
LEAD ACID BATTERIES
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588
LEAD POISONING
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
LEADING EDGE FLAPS
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle
[NASA-TP-2467] N85-33107
LEAST SQUARES METHOD
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637
LENSES
Influence of edge effects on performance of electrooptical lens N85-33366
Automatic sphericity interferometer for testing lens radii
[AD-A155736] N85-33457
LEVELING
Planetary surface processes: A review N85-33869
LIBRARIES
Lopez Energy Alternatives Project
[DE85-010589] N85-33837
Technology transfer system automation implementation
[PB85-177335] N85-33838
NBS (National Bureau of Standards) library serial holdings, 1985
[PB85-191948] N85-33839

LICENSING
Current regulatory and licensing status for byproduct sources, facilities and applications
[DE85-010967] N85-33796

LIFE (DURABILITY)
Corrosion management strategies for aircraft and related systems N85-33239

LIFE SCIENCES
USSR report: Space
[JPRS-USP-84-006] N85-33128

LIFE SUPPORT SYSTEMS
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691

LIFT
Circulation control lift generation experiment: Hardware development N85-33535

LIGHT (VISIBLE RADIATION)
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413

LIGHT BEAMS
Refraction of narrow probing light beam in multilayer optical fiber N85-33330
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431

LIGHT CURVE
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940

LIGHT EMISSION
Optical monitoring of gamma-ray source fields
[OG-1.1-7] N85-33908
Search for optical bursts from the gamma ray burst source GBS 0526-66
[OG-1.1-8] N85-33909

LIGHT EMITTING DIODES
Electrochromic display device
[AD-D011733] N85-33299
Transceiver test device
[AD-D011728] N85-33458

LIGHT IONS
Heavy ion medical accelerator options
[DE85-011204] N85-33784

LIGHT SCATTERING
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
Interrelations for the elements of the scattering matrix N85-33872

LIGHT SOURCES
Pulsed lasers for filming color holographic film images N85-33426
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049

LIGHT VALVES
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826

LIGHT WATER REACTORS
Neutron detector counting capabilities for (10) B-lined and (235) U fission chambers in high gamma-ray fluxes
[DE85-011893] N85-33780

LIGNITE
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215

LIMESTONE
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554

LINE SPECTRA
Voigt line profile computation of infrared lines in the stratosphere and mesosphere
[AERONOMICA-ACTA-A-294-1985] N85-33622
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962

LINEAR ACCELERATORS
Lasertron simulation with a two-gap output cavity
[DE85-011213] N85-33460
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Determination of DTL configurations
[DE85-010714] N85-33719
The cw operation of the FMIT RFQ accelerator
[DE85-012667] N85-33757
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
Proceedings of the 16th. LAMPF Users Group Meeting
[DE85-011888] N85-33773
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783
Accelerator vibration issues
[DE85-010766] N85-33791
New formulation for linear accelerator design
[DE85-011171] N85-33792

LINEAR CIRCUITS
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346

LINEAR ENERGY TRANSFER (LET)
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657

LINEAR EQUATIONS
Implementing linear multistep formulas for solving DAES
[DE85-012400] N85-33740

LINEAR FILTERS
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899

LINEAR SYSTEMS
Design and development of a linear thermal actuator N85-33518
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543

LINEARITY
Precision linear ramp function generator
[DE85-011647] N85-33304
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444

LININGS
Elevated temperature crack growth
[NASA-CR-174957] N85-33540
Prestressed concrete vessel according to the hot liner concept: A critical evaluation of experimental results with a prototype vessel
[OEFZS-4313] N85-33550

LIPID METABOLISM
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663

LIPSCHITZ CONDITION
Hardy spaces and the L sup P-Neumann problem for Laplace's equation in a Lipschitz domain
[CTH-MATH-1985-02] N85-33749

LIQUID CRYSTALS
Electrochromic display device
[AD-D011733] N85-33299
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826

LIQUID FUELS
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658

LIQUID HYDROGEN
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445

LIQUID INJECTION
Vortex generating flow passage design for increased film cooling effectiveness
[NASA-CASE-LEW-14039-1] N85-33433

LIQUID METALS
Rapid analysis of steels using laser-based techniques
[DE85-010747] N85-33232
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817

LIQUID SODIUM
Study of alternative system conversions for the Solar One pilot plant
[DE85-010026] N85-33594

LIQUID-VAPOR INTERFACES
The polar caps and the climatic evolution of Mars N85-33866

LIQUIDS
Thermophysical properties of fluids for the gas industry
[PB85-198471] N85-33227

LITHIUM
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575

LITHIUM SULFUR BATTERIES
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588

LITHOLOGY
Lithology and stratigraphy of drill holes completed during 1984 in LANL use areas of Yucca Flat, Nevada Test Site, volume 6
[DE85-010695] N85-33631

LITHOSPHERE
A solid-state framework for terrestrial upper mantles N85-33878
Contrasts in evolution of Venus and Earth N85-33880
The non-hydrostatic figures of the terrestrial planets N85-33887

LIVER
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663

LOCI
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962

LOCKING
Dual optical mechanical position tracker
[AD-D011739] N85-33811

LOG PERIODIC ANTENNAS
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387

LOGARITHMS
Adiabatic thermal models for planetary bodies N85-33881

LOGIC CIRCUITS
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Hardware realization of digital filters without multipliers N85-33340
Computer simulation of integrated injection logic N85-33349
Research on distributed artificial intelligence
[AD-A155356] N85-33733

LOGIC DESIGN
Modeling of discrete devices with use of multivalued logic and nomograms N85-33351
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410

LOGIC PROGRAMMING
Modeling of discrete devices with use of multivalued logic and nomograms N85-33351

LONG DURATION SPACE FLIGHT
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141

LONG RANGE WEATHER FORECASTING
Model projections of time-dependent response to increasing carbon dioxide
[DE85-013326] N85-33641

LONG TERM EFFECTS
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33865

LOOPS
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417

LOW COST
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703

LOW GRAVITY MANUFACTURING
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250

LOW REYNOLDS NUMBER
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle
[NASA-TP-2467] N85-33107

LOW TEMPERATURE
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
Low temperature experimental capability for use with gas guns
[DE85-010418] N85-33548
LOW TEMPERATURE TESTS
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551
LUBRICANT TESTS
The use of perfluoroether lubricants in unprotected space environments N85-33523
LUBRICANTS
The design and development of a spacecraft appendage tie down mechanism N85-33522
The use of perfluoroether lubricants in unprotected space environments N85-33523
LUMINOSITY
Solar variability observed through changes in solar figure and mean diameter
[DE85-012857] N85-33900
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
LUNAR CRUST
Primordial magmaspheres and their lasting consequences N85-33882
LUNAR MAGNETIC FIELDS
Magnetic field generation in the cores of terrestrial bodies N85-33894
LUNGS
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655

M

MACH NUMBER
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
MACHINE TOOLS
Standard series of direct-current motors for regulated electric drives N85-33375
Generation of round bores in composite structure railguns
[DE85-011872] N85-33501
MAGMA
Primordial magmaspheres and their lasting consequences N85-33882
Geochemical confirmation of the lunar magmasphere hypothesis N85-33895
MAGNESIUM
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755
MAGNETIC ANOMALIES
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
MAGNETIC COILS
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819
High-field launch electron cyclotron heating experiments in the ELMO Bumpy Torus
[DE85-012068] N85-33825
Design improvements and cost reductions for a 5000 MWh superconducting Magnetic Energy Storage plant
[DE85-010572] N85-33830
MAGNETIC DISKS
Conferences of quantum-radiooptics section N85-33380
MAGNETIC EFFECTS
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110
MAGNETIC ENERGY STORAGE
Design improvements and cost reductions for a 5000 MWh superconducting Magnetic Energy Storage plant
[DE85-010572] N85-33830
Superconducting magnetic energy storage for asynchronous electrical systems
[DE85-005986] N85-33832
MAGNETIC FIELD CONFIGURATIONS
Magnetic shielding with superconductors based on niobium-tin compounds N85-33370
Electron and ion cyclotron heating calculations in the tandem-mirror
[DE85-011858] N85-33797
Method and apparatus for maintaining equilibrium in a helical axis stellarator
[DE85-011626] N85-33815
Elmo bumpy square plasma confinement device
[DE85-011628] N85-33816
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU
[IFSI-85-2] N85-33844
MAGNETIC FIELDS
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
Analysis of solution of Bloch's equations in time domain N85-33371
Calculation of external magnetic field of a shielded transformer N85-33373
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794
Collisional transport for a superthermal ion species in a plasma
[DE85-011943] N85-33818
Striation free doped silicon
[AD-A155730] N85-33827
Magnetotails of the terrestrial planets: A comparative study N85-33875
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34085
MAGNETIC FLUX
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU
[IFSI-85-2] N85-33844
MAGNETIC INDUCTION
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
MAGNETIC MATERIALS
Metallic glass composition
[DE85-011594] N85-33253
Induction motors with minimum waste of magnetic iron N85-33377
MAGNETIC MEASUREMENT
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
Absolute measurement of Declination (D) by means of a proton magnetometer
[DMI-GEOPHYS-PAPERS-R-68] N85-33751
Interplanetary magnetic field control of high-latitude electric fields and currents determined from Greenland magnetometer data
[DMI-GEOPHYS-PAPERS-R-69] N85-33845
MAGNETIC MIRRORS
Elmo bumpy square plasma confinement device
[DE85-011628] N85-33816
MAGNETIC POLES
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
MAGNETIC RECORDING
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295
Module for interfacing microprocessors and microcomputer N85-33390
MAGNETIC RIGIDITY
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
An observation of cosmic ray positrons from 10-20 GeV
[OG-6.2-6] N85-34105
MAGNETIC SHIELDING
Magnetic shielding with superconductors based on niobium-tin compounds N85-33370
MAGNETIC SIGNALS
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
MAGNETIC SPECTROSCOPY
NMR in the 80 s: New nuclei, new pulses — nuclear magnetic resonance (NMR)
[DRIC-T-7467] N85-33754
MAGNETIC SUSPENSION
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
MAGNETIC TAPES
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295
MAGNETICALLY TRAPPED PARTICLES
System and method of operating toroidal magnetic confinement devices
[DE85-011670] N85-33814
MAGNETOHYDRODYNAMICS
Method and apparatus for maintaining equilibrium in a helical axis stellarator
[DE85-011626] N85-33815
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899
MAGNETOMETERS
The Galileo spacecraft magnetometer boom N85-33513
MAGNETOSPHERE
Statistical analyses in the study of solar wind-magnetosphere coupling
[DE85-009596] N85-33898
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899
On the emission region of gamma ray bursts
[OG-1.1-4] N85-33906
MAINTENANCE
Fusion Power Demonstration (FPD) maintenance and disassembly considerations
[DE85-011413] N85-33820
MALES
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
MALFUNCTIONS
General Aviation Airworthiness Alerts, no. 85
[FAA-AC-43-16] N85-33117
MAN ENVIRONMENT INTERACTIONS
Meteorology and Society: Statements presented at the 9th congress under agenda item 12 — World Meteorological Organization
[WMO-643] N85-33644
MAN MACHINE SYSTEMS
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
Machine intelligence for robotics applications
[DE85-011430] N85-33503
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527
MANAGEMENT
Management of Corrosion
[AGARD-LS-141] N85-33238
MANAGEMENT INFORMATION SYSTEMS
Integration of office automation within computing
[DE85-010021] N85-33736
MANGANESE
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
MANIPULATORS
Space robot simulator vehicle
[NASA-CR-176133] N85-33176
Future of robots in nuclear plants and processes
[DE85-011505] N85-33500
Dual arm master controller development N85-33526
MANNED ORBITAL LABORATORIES
USSR report: Space
[JPRS-USP-84-006] N85-33126
MANNED SPACE FLIGHT
USSR report: Space
[JPRS-USP-84-006] N85-33126
MANUFACTURING
Structure and functions of ultra-thin films of organic compounds
[DRIC-T-7481] N85-33188
MAPPING
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
MARINE ENVIRONMENTS
Corrosion management strategies for aircraft and related systems N85-33239
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244

MARINER 5 SPACE PROBE
Evaluation of semiconductor devices for Electric and Hybrid Vehicle (EHV) ac-drive applications, volume 2 [NASA-CR-176103] N85-33294
MARKOV PROCESSES
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318
Optimal complex nonlinear processing of continuous and pulsed signals N85-33320
Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361
Optimal Bayesian estimators for image segmentation and surface reconstruction [AD-A155732] N85-33704
MARS (PLANET)
The polar caps and the climatic evolution of Mars N85-33866
Volatiles on satellites of the outer solar system N85-33868
Permafrost features on Earth and Mars: Similarities, differences N85-33870
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884
What we have learned about the magnetic field of Mars N85-33892
MARS ATMOSPHERE
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853
MARS LANDING
Mars landing sites N85-33893
MARS PROBES
Mars landing sites N85-33893
MASCONS
The non-hydrostatic figures of the terrestrial planets N85-33887
MASS FLOW
Heat-mass flow enhancement system for a metal hydride assembly [DE85-010698] N85-33441
MASS SPECTRA
The muon content of EAS as a function of primary energy [OG-5.1-8] N85-34050
MASS SPECTROSCOPY
Determination of organobromide compounds in water by gas chromatography-negative ion chemical ionisation mass spectrometry [DRIC-T-7411] N85-33199
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry [ISL-R-109/84] N85-33226
MASS TO LIGHT RATIOS
The muon content of EAS as a function of primary energy [OG-5.1-8] N85-34050
MASS TRANSFER
Study of molecular diffusivity influence on mass transfer rate at a water-atmosphere interface N85-33222
Advances in open-cycle solid desiccant cooling [DE85-008797] N85-33590
MATCHING
Digital matched filter N85-33339
Hierarchical chamfer matching [FOA-C-30387-E1] N85-33558
MATERIALS HANDLING
Monosilane and disilane, 1984 report [DE85-008776] N85-33262
Corrosion resistant storage container for radioactive material [DE85-011666] N85-33765
Office of Civilian Radioactive Waste Management [DE85-012585] N85-33774
MATHEMATICAL LOGIC
System of microprocessor instructions N85-33362
MATHEMATICAL MODELS
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
Modeling granular explosive detonations with shear band concepts [DE85-011823] N85-33271
Model that predicts pulse charged gas switching breakdown phenomena [DE85-013119] N85-33313
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
Estimating optimum technical and economic indicators of data transmission systems N85-33406
Pulsed hydrojet propulsion [DE85-010771] N85-33446
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W) [CFD/84/21] N85-33448
Current internal-dosimetry practices at US Department of Energy facilities [DE85-011718] N85-33466
Numerical experiment of elastic wave propagation by framework model [DRIC-T-7462] N85-33511
Stochastic groundwater flow modeling using the second-order method [DE85-011250] N85-33556
Theory of cellwise optimization for solar central receiver system [DE85-012586] N85-33579
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1983 [CISE-2515] N85-33617
Model projections of time-dependent response to increasing carbon dioxide [DE85-013326] N85-33641
Data Base Workshop: Availability-Reliability Modeling [DE85-011570] N85-33713
Presentation of numerical simulation work in terminal ballistics using a few examples. Applications of the calculation model Program for Elastoplastic Simulation of Impacts (PEPSI) of the Franco-German Research Institute Saint Louis (ISL) [ISL-CO-209/84] N85-33741
A formulation and analysis of combat games [NASA-TP-2487] N85-33745
New formulation for linear accelerator design [DE85-011171] N85-33792
Late-stage planetesimals: How big? N85-33857
MATRICES (MATHEMATICS)
Detection of and search for faults in programmable logic arrays N85-33409
MATRIX MATERIALS
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission [DE85-011659] N85-33454
Development of solid thorium-232 reference materials [DE85-011453] N85-33785
MEASURE AND INTEGRATION
Some properties of Loeb-Sobolev spaces [CTH-MATH-1985-01] N85-33748
MEASURING INSTRUMENTS
Digital tachometer N85-33416
Capacitance measuring device [DE85-011643] N85-33460
Electrochemical methane sensor [DE85-011663] N85-33464
On-line temperature sensor [DE85-011641] N85-33465
Evaluation of coordinate measuring machines [DE85-011712] N85-33467
Development of a prototype energy meter [PB85-198430] N85-33476
MECHANICAL DEVICES
Hoop/column antenna deployment mechanism overview N85-33514
The properties of thin-section, four-point-contact ball bearings in space N85-33521
The design and development of a spacecraft appendage tie down mechanism N85-33522
MECHANICAL DRIVES
Department of Energy gear drive unit final prototype testing and design evaluation [DE85-003296] N85-33499
Ninteenth Aerospace Mechanisms Symposium [NASA-CP-2371] N85-33512
Drag-compensated, precision-powered hinge system N85-33517
The design and development of a constant-speed solar array drive N85-33519
Application of traction drives as servo mechanisms N85-33520
Features of the solar array drive mechanism for the space telescope N85-33532
Dual optical mechanical position tracker [AD-D011739] N85-33811
MECHANICAL ENGINEERING
Special tools used by cosmonauts in EVA N85-33129
MECHANICAL PROPERTIES
Effects of environment on spacecraft materials N85-33144
Filament wound structures in PSP carbon composite [RV10/84424] N85-33198
Rationale in the selection of corrosion protective coating systems N85-33242
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area [PB85-192276] N85-33559
MEDICAL EQUIPMENT
Heavy ion medical accelerator options [DE85-011204] N85-33784
MEDICAL SCIENCE
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687
MELTING
Experimental studies of glass refining [NASA-CR-176130] N85-33248
Laser effects on opaque targets. Part 2C: Thermal effects of a time-variable beam intensity [ISL-R-105/84-PT-2C] N85-33486
Technology of off-gas treatment for liquid-fed ceramic melters [DE85-012467] N85-33610
MEMORY (COMPUTERS)
Digital matched filter N85-33339
Basic features of personal computers N85-33344
Design of digital bandpass filters with finite memory N85-33392
MERCURY (METAL)
Environmental surveillance at Los Alamos during 1984 [DE85-011886] N85-33605
MERCURY (PLANET)
Questions about Mercury's role in comparative planetary geophysics N85-33861
MERCURY CADMIUM TELLURIDES
Mosaic Infrared Sensor for Space Astronomy (MIRSSA) [NASA-CR-176154] N85-33456
MERCURY COMPOUNDS
New and revised methods of purifying mercuric iodide [DE85-011684] N85-33237
MESONS
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility [DE85-011402] N85-33609
Proceedings of the 18th LAMPF Users Group Meeting [DE85-011888] N85-33773
MESOSCALE PHENOMENA
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloguium [PB85-188266] N85-33649
MESOSPHERE
Voigt line profile computation of infrared lines in the stratosphere and mesosphere [AERONOMICA-ACTA-A-294-1985] N85-33622
MESSAGE PROCESSING
Assured information flow capping architecture [AD-A155392] N85-33283
METABOLISM
Microwave radiation and thermoregulation [AD-A155718] N85-33654
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
METAL BONDING
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F --- aircraft structures [PV-43-954/F] N85-33510
METAL HYDRIDES
Heat-mass flow enhancement system for a metal hydride assembly [DE85-010698] N85-33441
METAL OXIDE SEMICONDUCTORS
Synthesis of tests for programmable logic arrays N85-33408
METAL OXIDES
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators [DE85-010827] N85-33230
METAL SURFACES
Materials characterization with intense positron beams [DE85-011850] N85-33769
METAL VAPORS
Metal vapor lasers and their applications [ISL-CO-218/84] N85-33488
METALLIC GLASSES
Metallic glass composition [DE85-011594] N85-33253
METALLIZING
Laser-assisted solar cell metallization processing [NASA-CR-176124] N85-33565
Ink jet printing of silver metallization for photovoltaics [NASA-CR-176054] N85-33569

METALS
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators
[DE85-010627] N85-33230
METAMORPHISM (GEOLOGY)
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634
METEORITES
Terrestrial Planets: Comparative Planetology
[NASA-CR-176093] N85-33849
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853
Ultraheavy cosmic ray tracks in meteorites: A reappraisal, based on calibrations with relativistic ions
[OG-4.4-10] N85-34041
METEOROLOGICAL BALLOONS
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648
METEOROLOGICAL INSTRUMENTS
Verification of Doppler sodar measurements — atmospheric boundary layer
[KNMI-WR-85-2] N85-33645
METEOROLOGICAL PARAMETERS
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648
METEOROLOGICAL RADAR
Method and apparatus for four-beam radar
[PB85-181477] N85-33289
METEOROLOGICAL SATELLITES
Six mechanisms used on the SSM/1 radiometer N85-33534
METEOROLOGICAL SERVICES
150 years of meteorology in Belgium N85-33642
METEOROLOGY
Meteorology and Society: Statements presented at the 9th congress under agenda item 12 — World Meteorological Organization
[WMO-643] N85-33644
METHANE
Electrochemical methane sensor
[DE85-011663] N85-33464
METRIC SPACE
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
MICROBIOLOGY
Results of microbiological studies conducted during operation of Salyut-6 orbital station N85-33682
MICROCOMPUTERS
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
Module for interfacing microprocessors and microcomputer N85-33390
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411
Microcomputer controlled image processor
[AD-D011734] N85-33735
MICROELECTRONICS
Space station automation study. Automation requirements derived from space manufacturing concepts. Volume 1: Executive summary
[NASA-CR-176099] N85-33170
Space Station automation study. Automation requirements derived from space manufacturing concepts. Volume 2: Technical report
[NASA-CR-176100] N85-33171
Photothyristor optrons and optron microcircuits, part 1 N85-33424
MICROORGANISMS
Results of microbiological studies conducted during operation of Salyut-6 orbital station N85-33682
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683
MICROPHONES
A theoretical appraisal of the use of ground-plane microphones for aircraft noise measurements
[NPL-AC-103] N85-33752
MICROPROCESSORS
Basic features of personal computers N85-33344
System of microprocessor instructions N85-33362
Module for interfacing microprocessors and microcomputer N85-33390
Developmental trends in radio receiver design N85-33407
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470
MICROSTRIP TRANSMISSION LINES
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422
Multidiode integrated-circuit protective device N85-33425
MICROSTRUCTURE
Microstructure-mechanical property relationships in the transformation-toughened ceramics
[DE85-011946] N85-33261
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
MICROWAVE AMPLIFIERS
High-power solid-state rf source for accelerator cavities
[DE85-012672] N85-33309
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
MICROWAVE ATTENUATION
Precision microwave attenuation measurement by time interval ratio
[RSRE-85005] N85-33280
MICROWAVE CIRCUITS
Software for frequency analysis of microwave circuits N85-33352
MICROWAVE EQUIPMENT
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
MICROWAVE FREQUENCIES
Effects of hydrometeors on electromagnetic wave propagation
[AD-A155379] N85-33297
Recording small frequency drifts of microwave oscillators N85-33372
Strongly coupled millimeter-band waveguide directional couplers N85-33418
MICROWAVE OSCILLATORS
Recording small frequency drifts of microwave oscillators N85-33372
MICROWAVE RADIOMETERS
Six mechanisms used on the SSM/1 radiometer N85-33534
MICROWAVE RESONANCE
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847
MICROWAVE SPECTRA
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847
MICROWAVE TRANSMISSION
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197
MICROWAVES
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Vacuum ultraviolet laser
[DE85-011632] N85-33478
Six mechanisms used on the SSM/1 radiometer N85-33534
Microwave radiation and thermoregulation
[AD-A155718] N85-33654
MIDDLE ATMOSPHERE
Middle Atmosphere Program. Handbook for MAP, volume 11
[NASA-CR-176107] N85-33625
MILITARY TECHNOLOGY
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting
[AD-A155383] N85-33553
MILLIMETER WAVES
Effects of hydrometeors on electromagnetic wave propagation
[AD-A155379] N85-33297
Examination of anisotropic films by resonance method N85-33412
Strongly coupled millimeter-band waveguide directional couplers N85-33418
Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
MINERAL EXPLORATION
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
MINERALOGY
Mineralogy and chemistry of the Earth N85-33877
MINERALS
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
MINIATURIZATION
Miniature two-mode filters N85-33394
MINICOMPUTERS
Electronic file system on an SM 90 minicomputer: The SARDE project
[ENST-84E018] N85-33705
MIRRORS
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495
Electron and ion cyclotron heating calculations in the tandem-mirror
[DE85-011858] N85-33797
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
MISSION PLANNING
Space station automation study. Automation requirements derived from space manufacturing concepts. Volume 1: Executive summary
[NASA-CR-176099] N85-33170
Space Station automation study. Automation requirements derived from space manufacturing concepts. Volume 2: Technical report
[NASA-CR-176100] N85-33171
MITOCHONDRIA
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663
MIXTURES
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Development of a prototype energy meter
[PB85-198430] N85-33476
MODAL RESPONSE
Multishaker modal testing
[NASA-CR-176139] N85-33544
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747
MODELS
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
Second order modelling in non-constant density flows N85-33206
Jet flows: Modelling and experiments N85-33208
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements
[AD-A155355] N85-33281
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Model building and practical aspects of nonlinear programming
[AD-A155720] N85-33711
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
Models of planetary structure and evolution: The case of Io N85-33874
On galactic origin of cosmic rays with energy up to 10(19) eV
[OG-5.4-15] N85-34091
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103
MODES
Miniature two-mode filters N85-33394
MODULUS OF ELASTICITY
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491
MOISTURE CONTENT
Fiber optic moisture sensor
[DE85-011651] N85-33462
Effect of substrate moisture on growth and structure of corn leaf N85-33692
MOISTURE METERS
Fiber optic moisture sensor
[DE85-011651] N85-33462
MOLDS
Method and apparatus for casting conductive and semi-conductive materials
[DE85-011655] N85-33494

MOLECULAR BEAM EPITAXY
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
MOLECULAR BEAMS
Interrelations for the elements of the scattering matrix
N85-33872
MOLECULAR CLOUDS
Galactic gamma-ray sources, SNOBs, and giant H2 regions
[OG-2.5-4] N85-33961
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
MOLECULAR DIFFUSION
Vortex dynamics simulation of conserved scalar dissipation N85-33210
MOLECULAR GASES
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
MOLECULAR STRUCTURE
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697
MOLECULAR WEIGHT
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
MOLECULES
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
Preparation and use of very pure o-D2
[DE85-009415] N85-33800
MOLTEN SALTS
Recent advances in d-c relaxation techniques for the measurement of kinetics of fast electrode reactions
[DE85-005029] N85-33216
Molten carbonate fuel cell separator
[DE85-011615] N85-33577
Study of alternative system conversions for the Solar One pilot plant
[DE85-010026] N85-33594
MOLYBDENUM ALLOYS
Fatigue behavior of chromium-containing ferritic steels at elevated temperature
[DE85-012309] N85-33231
MONKEYS
Morphological study of antiorthostatic hypokinesia in monkeys N85-33680
MONTE CARLO METHOD
Power density and threshold control strategies for radar track initiation
[AD-A155357] N85-33282
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
Nuclear data for MCNP
[DE85-010794] N85-33782
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
MOON
Geochemical confirmation of the lunar magmasphere hypothesis N85-33895
MORTARS (MATERIAL)
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263
MOSAICS
Mosaic Infrared Sensor for Space Astronomy (MIRSSA)
[NASA-CR-176154] N85-33456
MOTION PICTURES
Pulsed lasers for filming color holographic film images
N85-33426
MOTION SICKNESS
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Labyrinthine and extralabyrinthine mechanisms of development of motion sickness in weightlessness
N85-33668
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690
MOTORS
Dual optical mechanical position tracker
[AD-D011739] N85-33811
MOVING TARGET INDICATORS
Characteristics of digital range finder with stroboscopic discretization N85-33319
MULTIPLE BEAM INTERVAL SCANNERS
Method and apparatus for four-beam radar
[PB85-181477] N85-33289
MULTIPLIERS
Hardware realization of digital filters without multipliers
N85-33340
MULTIPROCESSING (COMPUTERS)
Use of monitors in Pascal on the Lemur: A tutorial on the barrier, self-scheduling FOR-loop, and askfor monitors
[ANL-84-53] N85-33706
Parallel Cholesky factorization in message-passing multiprocessor environments
[DE85-012079] N85-33717
Modeling and measurement of fault-tolerant multiprocessors
[NASA-CR-3920] N85-33732
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739
MULTISPECTRAL BAND SCANNERS
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Comprehensive mapping of arid territories of Arizona using space photography N85-33164
MULTISPECTRAL PHOTOGRAPHY
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR
N85-33155
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
MULTISTAGE ROCKET VEHICLES
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
MULTISTATIC RADAR
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322
MUONS
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920
Muon content of gamma ray induced EAS from Cygnus X-3
[OG-2.1-4] N85-33921
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
Constraints on cosmic-ray observation of Cygnus X-3
[OG-2.2-3] N85-33930
Search for excess showers from Crab Nebula
[OG-2.3-2] N85-33939
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969
The muon content of EAS as a function of primary energy
[OG-5.1-8] N85-34050
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34062
The primary composition beyond 10 to the 5th power GeV as deduced from high energy hadrons and muons in air showers
[OG-5.2-6] N85-34063
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
Anisotropy of cosmic rays of energy 10 (15) eV to 10 (17) eV observed at Akeno
[OG-5.3-3] N85-34070
The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075
MUSCLES
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
MUSCULOSKELETAL SYSTEM
Results and prospects of physiological research during spaceflights N85-33139
Formation of new microvessels in skeletal muscles of rats exposed to hypobaric hypoxia for one week
N85-33662
Morphological study of antiorthostatic hypokinesia in monkeys N85-33680
MUTATIONS
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
MYOCARDIUM
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664

N

N-TYPE SEMICONDUCTORS
TEMO and TEB thermoelectronic devices
N85-33415
NASA PROGRAMS
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 27)
[NASA-SP-7039(27)-SECTION-1] N85-33840
NATURAL GAS
Development of a prototype energy meter
[PB85-198430] N85-33476
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
NATURAL GAS EXPLORATION
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
NATURAL LANGUAGE (COMPUTERS)
Research on distributed artificial intelligence
[AD-A155356] N85-33733
NATURAL SATELLITES
Extended atmospheres of outer planet satellites and comets
[NASA-CR-176137] N85-33848
What determines the location of satellites and planets? N85-33858
Volatiles on satellites of the outer solar system
N85-33868
Interpretation of photometric measurements of airless bodies N85-33871
NAVIER-STOKES EQUATION
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
Jet flows: Modelling and experiments N85-33208
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field
[NASA-TM-87581] N85-33436
NEAR WAKES
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450
NEBULAE
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109
NEGATRONS
An observation of cosmic ray positrons from 10-20 GeV
[OG-6.2-6] N85-34105

NEODYMIUM LASERS
Switching power supply
[DE85-005993] N85-33312
NEON
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
NEON ISOTOPES
The energy dependence of the neon-22 excess in the cosmic radiation
[OG-4.3-7] N85-34032
NETWORK ANALYSIS
Harold Hazen and the theory and design of servomechanism
[RR-270] N85-33506
NEUMANN PROBLEM
Hardy spaces and the L sup P-Neumann problem for Laplace's equation in a Lipschitz domain
[CTH-MATH-1985-02] N85-33749
NEUTRINO BEAMS
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
NEUTRINOS
Neutrino-antineutrino annihilation around collapsing star
[OG-1.1-10] N85-33911
NEUTRON COUNTERS
Neutron detector counting capabilities for (10) B-lined and (235) U fission chambers in high gamma-ray fluxes
[DE85-011893] N85-33780
NEUTRON EMISSION
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission
[DE85-011659] N85-33454
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808
NEUTRON FLUX DENSITY
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786
NEUTRON PHYSICS
Nuclear data for MCNP
[DE85-010794] N85-33782
NEUTRON SCATTERING
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
NEUTRON SOURCES
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775
NEUTRON SPECTRA
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786
Microdosimetric spectra measurements of JANUS neutrons
[DE85-012108] N85-33801
NEUTRON STARS
Annihilation radiation in cosmic gamma-ray bursts
[OG-1.1-3] N85-33905
On the emission region of gamma ray bursts
[OG-1.1-4] N85-33906
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range
[OG-2.2-10] N85-33936
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1
[MPE-191] N85-34112
NEUTRONS
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness
[OEFZS-4312] N85-33762
NEVADA
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
NEWTONIAN FLUIDS
On the importance of viscous dissipation in lo
N85-33873
NICKEL
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
NICKEL ALLOYS
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228
Metallic glass composition
[DE85-011594] N85-33253
NICKEL STEELS
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
NICKEL ZINC BATTERIES
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588
NIOBIUM ALLOYS
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33308
NITRATES
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
NITRIC OXIDE
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
NITRIDES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
NITRO COMPOUNDS
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
NITROGEN DIOXIDE
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
NITROGEN ISOTOPES
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027
NITROGEN OXIDES
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Atmospheric reaction products from hazardous air pollutant degradation
[PB85-185841] N85-33620
NITROGEN PLASMA
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813
NOAA SATELLITES
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements
[NOAA-TR-NESDIS-23] N85-33626
NOISE (SOUND)
Noise in stages and in interstage couplings of various transistor circuits N85-33334
NOISE INTENSITY
Noise in stages and in interstage couplings of various transistor circuits N85-33334
NOISE MEASUREMENT
A theoretical appraisal of the use of ground-plane microphones for aircraft noise measurements
[NPL-AC-103] N85-33752
NOISE PREDICTION
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109
NOISE REDUCTION
Discussion of the paper, Some Aspects of Propulsion for the Augmenter-Wing Concept, by D. C. Whittley
[NASA-TM-77884] N85-33108
NOMOGRAPHS
Modeling of discrete devices with use of multivalued logic and nomograms N85-33351
NONEQUILIBRIUM CONDITIONS
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
NONLINEAR FILTERS
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323
Nonlinear filtration of clutter N85-33404
NONLINEAR PROGRAMMING
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
Model building and practical aspects of nonlinear programming
[AD-A155720] N85-33711
NONLINEARITY
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels
[NASA-CR-176148] N85-33546
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4
[DE85-012968] N85-33831
NONUNIFORMITY
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
NORTH POLAR SPUR (ASTRONOMY)
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
NORTHERN HEMISPHERE
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
NORTHERN SKY
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
NOSE CONES
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
NOZZLES
Discussion of the paper, Some Aspects of Propulsion for the Augmenter-Wing Concept, by D. C. Whittley
[NASA-TM-77884] N85-33108
NUCLEAR ELECTRIC POWER GENERATION
Magnetic Fusion Program plan
[DE85-009661] N85-33823
NUCLEAR EMULSIONS
The inner granulometric density of the tracks in nuclear emulsions and its application to determine the chemical spectrum of primary cosmic ray nuclidi
[OG-4.3-9] N85-34034
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
NUCLEAR FUELS
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802
NUCLEAR FUSION
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003
Diffuse galactic annihilation radiation from supernova nucleosynthesis
[OG-3.2-8] N85-34004
NUCLEAR INTERACTIONS
Gamma ray line production from cosmic ray spallation reactions N85-34005
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
Search for heavy antinuclei in the cosmic radiation
[OG-6.1-2] N85-34093
NUCLEAR MAGNETIC RESONANCE
NMR in the 80 s: New nuclei, new pulses — nuclear magnetic resonance (NMR)
[DRIC-T-7467] N85-33754
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772

NUCLEAR MODELS
Heavy quarks and CP: Moriond 1985
[DE85-010553] N85-33790
Quark structure of nuclei
[DE85-010781] N85-33795
NUCLEAR PHYSICS
Proceedings of the 18th LAMPF Users Group Meeting
[DE85-011888] N85-33773
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775
NUCLEAR POTENTIAL
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789
NUCLEAR POWER PLANTS
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724
NUCLEAR RADIATION SPECTROSCOPY
NMR in the 80 s: New nuclei, new pulses — nuclear magnetic resonance (NMR)
[DRIC-T-7467] N95-33754
NUCLEAR REACTIONS
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness
[OEFZS-4312] N85-33762
Bibliography and index for nuclear reactions among light charged particles, volume 26
[DE85-011482] N85-33768
NUCLEAR REACTORS
On-line temperature sensor
[DE85-011641] N85-33465
Data Base Workshop: Availability-Reliability Modeling
[DE85-011570] N85-33713
NUCLEAR RESEARCH AND TEST REACTORS
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
NUCLEATION
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
Interrelationships among the terrestrial planets
N85-33659
NUCLEI (NUCLEAR PHYSICS)
NMR in the 80 s: New nuclei, new pul es — nuclear magnetic resonance (NMR)
[DRIC-T-7467] N85-33754
Ninteenth International Cosmic Ray Conference. OG sessions, volume 2
[NASA-CP-2376-VOL-2] N85-34006
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
Charge and energy dependence of the residence time of cosmic ray nuclei below 15 GeV/nucleon
[OG-4.1-3] N85-34009
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope
[OG-4.1-5] N85-34011
Energy spectrum of cosmic-ray iron nucleus observed with emulsion chamber
[OG-4.1-10] N85-34016
Measurement of the iron spectrum from 60 to 200 GeV per nucleon
[OG-4.1-11] N85-34017
Cosmic ray nuclei of energy 50 GeV/NUC
[OG-4.1-12] N85-34018
Composition and energy spectra of cosmic ray nuclei above 500 GeV/nucleon from the JACEE emulsion chambers
[OG-4.1-13] N85-34019
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020
Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
[OG-4.2-2] N85-34022
Primary cosmic ray spectrum in the 10 to the 12th power - 10 to the 16th power eV energy range from the NUSEX experiment
[OG-5.1-5] N85-34047
Observation of arrival times of EAS with energies or = 6 x 10 (14) eV
[OG-5.3-8] N85-34074
Search for heavy antinuclei in the cosmic radiation
[OG-6.1-2] N85-34093
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097
NUCLEONS
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789
New calorimetric all-particle energy spectrum
[OG-5.1-4] N85-34046
NUCLIDES
The isotopic composition of cosmic ray chlorine
[OG-4.3-3] N85-34028
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope
[OG-4.3-4] N85-34029
The inner granulometric density of the tracks in nuclear emulsions and its application to determine the chemical spectrum of primary cosmic ray nuclidi
[OG-4.3-9] N85-34034
NUMERICAL ANALYSIS
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points
[NASA-CASE-MFS-25319-1] N85-33701
QKPLT users guide, version 2.0
[L-10094-M] N85-33707
Implementing linear multistep formulas for solving DAES
[DE85-012400] N85-33740
NUMERICAL CONTROL
Standard series of direct-current motors for regulated electric drives N85-33375

O

OCCULTATION
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637
OCEAN BOTTOM
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632
Arctic and offshore research
[DE85-001995] N85-33653
OCEAN DATA ACQUISITIONS SYSTEMS
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
OCEAN DYNAMICS
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
OCEAN SURFACE
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time
N85-33384
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
OCEAN TEMPERATURE
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
OCEANOGRAPHIC PARAMETERS
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time
N85-33384
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
OCEANS
Global environmental transport models for tritium
[DE85-011437] N85-33639
OFFGASSING
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
OIL EXPLORATION
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
ONBOARD EQUIPMENT
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318
ONTOGENY
General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite
N85-33679
OPACITY
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
OPERATOR PERFORMANCE
Operator's functional comfort zone when controlling moving object N85-33670
OPTICAL COMPUTERS
Methods for the optical processing of signals
[DRIC-T-7439] N85-33809
OPTICAL DATA PROCESSING
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Characteristics of optical information-measurement channels with utilization of scattering effects
N85-33429
OPTICAL DATA STORAGE MATERIALS
Conferences of quantum-radiooptics section
N85-33380
OPTICAL DISKS
Conferences of quantum-radiooptics section
N85-33380
OPTICAL EQUIPMENT
Conferences of quantum-radiooptics section
N85-33380
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
OPTICAL MEASURING INSTRUMENTS
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474
OPTICAL PATHS
Microcomputer controlled image processor
[AD-D011734] N85-33735
OPTICAL PROPERTIES
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
OPTICAL THICKNESS
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
OPTICAL WAVEGUIDES
Photothyristor optrons and optron microcircuits, part 1
N85-33424
OPTIMIZATION
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
Optimization of radioelectronic circuits with software for modeling of integrated circuits on unified system computer N85-33354
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
Gradiental adaptive corrector with optimum tuning step N85-33403
Synthesis of system with nonideal components for optimal processing of radio signal N85-33405
Estimating optimum technical and economic indicators of data transmission systems N85-33406
Theory of cellwise optimization for solar central receiver system
[DE85-012586] N85-33579
Blanket optimization studies for Cascade
[DE85-010002] N85-33824
ORBIT TRANSFER VEHICLES
A review of shock waves around aeroassisted orbital transfer vehicles
[NASA-TM-86769] N85-33177
A dual, fault-tolerant aerospace actuator N85-33530
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531
ORBITAL ASSEMBLY
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516
ORBITAL MANEUVERING VEHICLES
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
ORBITAL MECHANICS
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539
ORBITAL SERVICING
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516

ORGANIC COMPOUNDS
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659
ORGANIC MATERIALS
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
ORGANIC SEMICONDUCTORS
Structure and functions of ultra-thin films of organic compounds
[DRIC-T-7481] N85-33188
ORGANOMETALLIC COMPOUNDS
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
ORTHOSTATIC TOLERANCE
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
ORTHOTROPIC PLATES
The stress distribution in pin-loaded orthotropic plates
[NASA-CR-176146] N85-33547
OSCILLATIONS
Saturation of a longitudinal instability due to nonlinearity of the wake field
[DE85-012514] N85-33761
OSTEOPOROSIS
Mechanisms of osteodystrophy in weightlessness N85-33143
OTOLITH ORGANS
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690
OXIDATION
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854
OXIDATION-REDUCTION REACTIONS
Isotopic Biogeochemistry
[NASA-CR-176128] N85-33189
OXIDES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
OXIDIZERS
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828
OXYFLUORIDES
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
OXYGEN
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Durability of oxygen sensors
[PB85-183093] N85-33477
OXYGEN ISOTOPES
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027
OXYGENATION
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
OZONE
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Atmospheric reaction products from hazardous air pollutant degradation
[PB85-185841] N85-33620
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements
[NOAA-TR-NESDIS-23] N85-33626
OZONOMETRY
Ozone during sudden stratospheric warming: A three-dimensional simulation
[AERONOMICA-ACTA-A-292-1984] N85-33621

P

P-N-P JUNCTIONS
KT3127A, KT3128A transistors N85-33414
P-TYPE SEMICONDUCTORS
TEMO and TEB thermoelectronic devices N85-33415
PACIFIC NORTHWEST (US)
Pacific Northwest and Alaska bioenergy program glossary
[DE85-011740] N85-33591
PAINTS
Land vehicle corrosion management N85-33246
PAIR PRODUCTION
Secondary antiproton production in relativistic plasmas
[OG-6.1-4] N85-34095
PANELS
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels
[NASA-TP-2480] N85-33537
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels
[NASA-CR-176148] N85-33546
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
Removable cleanable antireflection shield
[AD-D011735] N85-33810
PARABOLIC ANTENNAS
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387
PARALLEL PROCESSING (COMPUTERS)
Optimum predistortion of digital signals for transmission over parallel channels N85-33397
PARALLEL PROGRAMMING
Parallel Cholesky factorization in message-passing multiprocessor environments
[DE85-012079] N85-33717
PARAMETER IDENTIFICATION
Synthesis of adaptive filters for tracking radio systems N85-33325
PARAMETERIZATION
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
PARTICLE ACCELERATION
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
PARTICLE ACCELERATOR TARGETS
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775
PARTICLE ACCELERATORS
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
Supermite vacuum interface design
[DE85-012861] N85-33759
Rf program for LAMPF 2
[DE85-012693] N85-33760
PARTICLE BEAMS
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
Rf program for LAMPF 2
[DE85-012693] N85-33760
Polarization of fast particle beams by collisional pumping
[DE85-011621] N85-33764
Accelerator vibration issues
[DE85-010766] N85-33791
Interrelations for the elements of the scattering matrix N85-33872
PARTICLE COLLISIONS
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness
[OEFZS-4312] N85-33762
Gamma ray line production from cosmic ray spallation reactions N85-34005
PARTICLE DENSITY (CONCENTRATION)
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
PARTICLE DIFFUSION
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
PARTICLE EMISSION
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
PARTICLE ENERGY
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102
PARTICLE INTERACTIONS
Interacting Boson approximation
[DE85-003016] N85-33756
Polarization of fast particle beams by collisional pumping
[DE85-011621] N85-33764
Proceedings of the 18th LAMPF Users Group Meeting
[DE85-011888] N85-33773
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
PARTICLE MASS
Does low-energy physics depend on the potential of a heavy Higgs-particle
[NIKHEF-H/85-1] N85-33763
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
PARTICLE MOTION
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110
PARTICLE PRODUCTION
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
PARTICLE SIZE DISTRIBUTION
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
PARTICLE TRACKS
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822
Ultraheavy cosmic ray tracks in meteorites: A reappraisal, based on calibrations with relativistic ions
[OG-4.4-10] N85-34041
PARTICLE TRAJECTORIES
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
PARTICLES
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438

PARTICULATE SAMPLING
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
PASCAL (PROGRAMMING LANGUAGE)
Use of monitors in Pascal on the Lemur: A tutorial on the barrier, self-scheduling FOR-loop, and askfor monitors
[ANL-84-53] N85-33706
PATENT APPLICATIONS
Dual optical mechanical position tracker
[AD-D011739] N85-33811
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 27)
[NASA-SP-7039(27)-SECTION-1] N85-33840
PATENTS
NASA patent abstracts bibliography: A continuing bibliography. Section 1: Abstracts (supplement 27)
[NASA-SP-7039(27)-SECTION-1] N85-33840
PATHOGENESIS
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683
PATTERN REGISTRATION
Repetition of dense cloud cover above Indian Ocean from generalized satellite data N85-33165
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
Depth dimension compression of 3-D images N85-33332
PAYLOAD DELIVERY (STS)
A dual, fault-tolerant aerospace actuator N85-33530
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531
PAYLOAD DEPLOYMENT & RETRIEVAL SYSTEM
A dual, fault-tolerant aerospace actuator N85-33530
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531
Appendange deployment mechanism for the Hubble Space Telescope program N85-33533
PERCHLORATES
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772
PERFLUORO COMPOUNDS
The use of perfluoroether lubricants in unprotected space environments N85-33523
PERFORMANCE PREDICTION
Environmental factors in corrosion and deterioration of materials N85-33241
Design and development of a linear thermal actuator N85-33518
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
PERFORMANCE TESTS
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Partial discharges in and electric strength of high-voltage polymer insulation at cryogenic temperatures N85-33364
Beta response of selected instruments
[DE85-013278] N85-33469
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491
Failure testing of active solar energy system components
[DE84-013024] N85-33561
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
PERIODIC VARIATIONS
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925
Secondary periodicities of microbursts of TeV gamma rays from the Crab pulsar
[OG-2.3-5] N85-33942
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
Search for periodicities near 59 s in the COS-B gamma-ray data of 2CG195+04 (Geminga)
[OG-2.4-3] N85-33950
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
PERIODICALS
Lopez Energy Alternatives Project
[DE85-010589] N85-33837
NBS (National Bureau of Standards) library serial holdings, 1985
[PB85-191948] N85-33839
PERMAFROST
Permafrost features on Earth and Mars: Similarities, differences N85-33870
PERMEABILITY
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635
PERMITTIVITY
Examination of anisotropic films by resonance method N85-33412
PEROVSKITES
Integrated current collector and catalyst support
[DE85-011616] N85-33311
PERSONALITY TESTS
Rapid determination of cadet discipline by projective tests N85-33671
PERTURBATION
The polar caps and the climatic evolution of Mars N85-33866
PETN
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry
[ISL-R-109/84] N85-33226
PETRI NETS
Petcom: A software instrument for the analysis of Petri networks, oriented towards communication protocols
[FUB-50-1983] N85-33286
PETROLOGY
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634
PH FACTOR
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
PHARMACOLOGY
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
PHASE LOCKED SYSTEMS
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417
PHASE SHIFT KEYING
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338
PHASE TRANSFORMATIONS
Microstructure-mechanical property relationships in the transformation-toughened ceramics
[DE85-011946] N85-33261
PHASED ARRAYS
Adaptive synthesis of antennas with separation of signals by direction of arrival N85-33328
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387
PHENOLIC RESINS
Long-term strength of glass fibre/phenolic resin composites
[NPL-DMA(A)-98] N85-33195
PHENOMENOLOGY
An internally consistent gamma ray burst time history phenomenology
[OG-1.2-6] N85-33916
PHONEMES
Phonetic transcription statistics: Constitution and statistical utilization
[ENST-85D001] N85-33285
PHONETICS
Phonetic transcription statistics: Constitution and statistical utilization
[ENST-85D001] N85-33285
PHOTOCHEMICAL OXIDANTS
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
PHOTODISSOCIATION
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
PHOTOELECTRIC CELLS
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity
[DE85-011602] N85-33258
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
PHOTOELECTRIC EMISSION
Dual optical mechanical position tracker
[AD-D011739] N85-33811
PHOTOELECTRON SPECTROSCOPY
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228
PHOTOGEOLOGY
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
PHOTOIONIZATION
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755
PHOTOLYSIS
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
PHOTOMAPPING
Mapping of dynamics of deltas by space photography N85-33163
Comprehensive mapping of arid territories of Arizona using space photography N85-33164
PHOTOMETERS
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413
PHOTOMETRY
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
Interpretation of photometric measurements of airless bodies N85-33871
PHOTOMULTIPLIER TUBES
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
PHOTON BEAMS
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
PHOTON DENSITY
Low-energy gamma rays from Cygnus X-1
[OG-2.4-13] N85-33957
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
A new measurement of the cosmic ray energy spectrum between 3 x 10 to the 15th power eV and 3 x 10 to the 16th power eV
[OG-5.1-6] N85-34048
PHOTONS
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
A search in the COS-B data base for correlated time variability in regions containing objects of interest
[OG-2.5-9] N85-33964
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
PHOTONUCLEAR REACTIONS
Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767
Nuclear data for MCNP
[DE85-010794] N85-33782

PHOTOSENSITIVITY
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
Liquid crystal light valve structures [NASA-CASE-MSC-20036-1] N85-33826
PHOTOSYNTHESIS
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
PHOTOVOLTAIC CELLS
Development of high-efficiency solar cells on silicon web [NASA-CR-176101] N85-33568
Photovoltaics technical information guide [DE85-002924] N85-33585
Photovoltaic industry progress through 1984 [DE85-013029] N85-33596
Federal export assistance programs applicable to the US photovoltaic industry [NASA-CR-176114] N85-33841
PHOTOVOLTAIC CONVERSION
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
Photovoltaic energy systems [DE85-011630] N85-33581
PHOTOVOLTAIC EFFECT
Ink jet printing of silver metallization for photovoltaics [NASA-CR-176054] N85-33569
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
Photovoltaic industry progress through 1984 [DE85-013029] N85-33596
PHYSICAL EXERCISE
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
PHYSIOLOGICAL EFFECTS
Results and prospects of physiological research during spaceflights N85-33139
Antihypertensive neutral lipid [DE85-011625] N85-33656
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686
PHYSIOLOGICAL FACTORS
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687
PHYSIOLOGICAL RESPONSES
Microwave radiation and thermoregulation [AD-A155718] N85-33654
PHYSIOLOGY
USSR report: Life sciences. Biomedical and behavioral sciences [JPRS-UBB-85-018] N85-33660
PIEZOELECTRICITY
Device for frequency modulation of a laser output spectrum [DE85-011634] N85-33479
Non-bonded ultrasonic transducer [DE85-011006] N85-33504
PILOT PLANTS
Study of alternative system conversions for the Solar One pilot plant [DE85-010026] N85-33594
PILOT SELECTION
Rapid determination of cadet discipline by projective tests N85-33671
PILOT TRAINING
Rapid determination of cadet discipline by projective tests N85-33671
PINS
The stress distribution in pin-loaded orthotropic plates [NASA-CR-176146] N85-33547
PIPE FLOW
Computer and water-model simulation of flow through poppet valves [CFD/85/2] N85-33449
Experimental simulation of in-bore flows using a high pressure shock tube [ISL-CO-217/84] N85-33452
PIPES (TUBES)
Process and device for forming imprints on ceramic tubes [DE85-013137] N85-33264
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions [NASA-CR-176147] N85-33545
PITUITARY GLAND
Regulation of physical activity in antiorthostatic position by acting on adrenosympathetic and hypophyseo-adrenocortical systems N85-33689
PLANETARY ATMOSPHERES
Impact processes and their implications for planetary formation and early evolution N85-33860
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
Volatiles on satellites of the outer solar system N85-33868
Interrelations for the elements of the scattering matrix N85-33872
PLANETARY COMPOSITION
Terrestrial Planets: Comparative Planetology [NASA-CR-176093] N85-33849
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
Mineralogy and chemistry of the Earth N85-33877
PLANETARY CORES
Planetary reorientation by surface loads N85-33886
Geochemical confirmation of the lunar magmasphere hypothesis N85-33895
PLANETARY ENVIRONMENTS
Impact processes and their implications for planetary formation and early evolution N85-33860
Questions about Mercury's role in comparative planetary geophysics N85-33861
PLANETARY EVOLUTION
Comments on RS-17 X-ray telescope N85-33132
Terrestrial Planets: Comparative Planetology [NASA-CR-176093] N85-33849
Relationships between chondritic meteorites and planets N85-33851
Interrelationships among the terrestrial planets N85-33859
Questions about Mercury's role in comparative planetary geophysics N85-33861
Volatile loss following very large impacts N85-33862
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33865
The polar caps and the climatic evolution of Mars N85-33866
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
Volatiles on satellites of the outer solar system N85-33868
Planetary surface processes: A review N85-33869
Interpretation of photometric measurements of airless bodies N85-33871
Models of planetary structure and evolution: The case of Io N85-33874
Mineralogy and chemistry of the Earth N85-33877
Crustal development in the terrestrial planets N85-33879
Contrasts in evolution of Venus and Earth N85-33880
Primordial magmaspheres and their lasting consequences N85-33882
PLANETARY GEOLOGY
Questions about Mercury's role in comparative planetary geophysics N85-33861
PLANETARY GRAVITATION
The non-hydrostatic figures of the terrestrial planets N85-33887
Admittance functions from Venus vertical gravity and modes of topographic support N85-33889
PLANETARY MAGNETIC FIELDS
The magnetic field of planets N85-33891
What we have learned about the magnetic field of Mars N85-33892
Magnetic field generation in the cores of terrestrial bodies N85-33894
PLANETARY MANTLES
A solid-state framework for terrestrial upper mantles N85-33878
Crustal development in the terrestrial planets N85-33879
The non-hydrostatic figures of the terrestrial planets N85-33887
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888
PLANETARY ORBITS
The coorbital hypothesis N85-33890
PLANETARY STRUCTURE
Planetary surface processes: A review N85-33869
Models of planetary structure and evolution: The case of Io N85-33874
Planetary reorientation by surface loads N85-33886
The non-hydrostatic figures of the terrestrial planets N85-33887
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888
PLANETARY SURFACES
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867
Planetary surface processes: A review N85-33869
Permafrost features on Earth and Mars: Similarities, differences N85-33870
Interpretation of photometric measurements of airless bodies N85-33871
Planetary reorientation by surface loads N85-33886
PLANETARY TEMPERATURE
Planetary fluids He and NH3 at high shock pressures and temperatures [DE85-011851] N85-33895
PLANETOLOGY
Spacecraft-aided research discussed at geology Congress N85-33147
Terrestrial Planets: Comparative Planetology [NASA-CR-176093] N85-33849
PLANT DESIGN
Some plant location problems — computer networks [FUB-14-1984] N85-33746
PLANTS (BOTANY)
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico [DE85-011175] N85-33607
Effect of substrate moisture on growth and structure of corn leaf N85-33692
PLASMA ARC WELDING
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic [VTT-339] N85-33551
PLASMA CONDUCTIVITY
Current enhancement in a conducting channel [AD-A155418] N85-33812
PLASMA CONTROL
System and method of operating toroidal magnetic confinement devices [DE85-011670] N85-33814
Method and apparatus for maintaining equilibrium in a helical axis stellarator [DE85-011626] N85-33815
Elmo bumpy square plasma confinement device [DE85-011628] N85-33816
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research [DE85-011463] N85-33821
PLASMA CURRENTS
Current enhancement in a conducting channel [AD-A155418] N85-33812
PLASMA DIODES
Electrochromic display device [AD-D011733] N85-33299
PLASMA DISPLAY DEVICES
Electrochromic display device [AD-D011733] N85-33299
PLASMA EQUILIBRIUM
Recombination and ionization in a nitrogen plasma [AD-A155426] N85-33813
PLASMA HEATING
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research [DE85-011463] N85-33821
PLASMA JETS
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations [OG-2.7-12] N85-33985
PLASMA PHYSICS
Data Base Workshop: Availability-Reliability Modeling [DE85-011570] N85-33713
Electron and ion cyclotron heating calculations in the tandem-mirror [DE85-011858] N85-33797
Magnetic Fusion Program plan [DE85-009861] N85-33823
PLASMADYNAMIC LASERS
Metal vapor lasers and their applications [ISL-CO-218/84] N85-33488
PLASMAS (PHYSICS)
Electron and ion cyclotron heating calculations in the tandem-mirror [DE85-011858] N85-33797
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research [DE85-011463] N85-33821

PLASTIC DEFORMATION
Presentation of numerical simulation work in terminal ballistics using a few examples. Applications of the calculation model Program for Elastoplastic Simulation of Impacts (PEPSI) of the Franco-German Research Institute Saint Louis (ISL)
[ISL-CO-209/84] N85-33741

PLATES (TECTONICS)
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632

PLETHYSMOGRAPHY
Vascular mechanisms of adaptation to antiorthostatic position N85-33675

PLUMES
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638

PLUNGERS
Design of inductive shift transducers N85-33368

PLUTONIUM 238
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
Long-term exposure of (238) PuO2 to a terrestrial environment, volume 3
[DE85-011896] N85-33781
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786

PLUTONIUM 239
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611

POINT DEFECTS
Defect interactions at high concentrations in solid oxide electrolytes
[DE85-011824] N85-33580

POINT SOURCES
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
Nineteenth International Cosmic Ray Conference. OG sessions, volume 1
[NASA-CP-2376-VOL-1] N85-33902
A search for gamma-ray point sources with the Carpet shower array
[OG-2.1-12] N85-33928
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969

POINTS (MATHEMATICS)
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points
[NASA-CASE-MFS-25319-1] N85-33701

POISSON EQUATION
Admissible convergence of Poisson integrals in symmetric spaces
[CTH-MATH-1985-04] N85-33750

POLAR CAPS
The polar caps and the climatic evolution of Mars N85-33866

POLAR ORBITS
The space station polar platform: NOAA systems considerations and requirements
[NOAA-TR-NESDIS-22] N85-33182

POLAR REGIONS
Interplanetary magnetic field control of high-latitude electric fields and currents determined from Greenland magnetometer data
[DMI-GEOPHYS-PAPERS-R-69] N85-33845

POLARIMETERS
Program for observations of Halley's comet N85-33138

POLARIZATION (SPIN ALIGNMENT)
Polarization of fast particle beams by collisional pumping
[DE85-011621] N85-33764

POLARIZATION (WAVES)
Preparation and use of very pure o-D2
[DE85-009415] N85-33800

POLARIZATION CHARACTERISTICS
Analysis of Jovian decametric data: Study of radio emission mechanisms
[NASA-CR-176057] N85-33846

POLARIZED RADIATION
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788

POLLUTION
Protective systems and maintenance policies for marine environments N85-33245
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640

POLLUTION CONTROL
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610

POLLUTION MONITORING
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638

POLLUTION TRANSPORT
MELSAR: A mesoscale air quality model for complex terrain. Volume 1: Overview, technical description and user's guide
[DE85-010943] N85-33608
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638

POLYACETYLENE
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257

POLYCHLORINATED BIPHENYLS
Soil extraction kit
[AD-D011736] N85-33190

POLYCRYSTALS
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256

POLYETHYLENES
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
Polyethylene solidification of low-level wastes
[DE85-012568] N85-33799

POLYMER MATRIX COMPOSITES
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265

POLYMERIC FILMS
Radiation-hardened polymeric films
[DE85-011636] N85-33259

POLYNOMIALS
An algorithm for the generation of primitive polynomials
[FUB-17-1984] N85-33730

POLYPROPYLENE
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity
[DE85-011602] N85-33258

POLYURETHANE FOAM
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363

PONDS
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658

POPULATION INVERSION
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485

POROSITY
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557

POROUS MATERIALS
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225

POROUS PLATES
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224

POSITION (LOCATION)
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413
Evaluation of coordinate measuring machines
[DE85-011712] N85-33467
Dual optical mechanical position tracker
[AD-D011739] N85-33811
What determines the location of satellites and planets? N85-33858

POSITIONING
The Galeleo spacecraft magnetometer boom N85-33513

POSITRON ANNIHILATION
Materials characterization with intense positron beams
[DE85-011850] N85-33769
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988

POSITRONS
Materials characterization with intense positron beams
[DE85-011850] N85-33769
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779
Observation of cosmic ray positrons from 5 to 25 GeV
[OG-6.2-5] N85-34104
An observation of cosmic ray positrons from 10-20 GeV
[OG-6.2-6] N85-34105
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108

POTABLE WATER
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
Experimental validation of allowable concentrations of sodium and potassium in recycled drinking water N85-33685

POTASSIUM COMPOUNDS
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream
[DE85-011357] N85-33214

POTASSIUM PHOSPHATES
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4
[DE85-012968] N85-33831

POTATOES
Use of gamma radiation as a form of preservation of sweet potatoes
[DE85-011998] N85-33787

POTENTIAL GRADIENTS
Influence of edge effects on performance of electrooptical lens N85-33366

POTENTIOMETERS (RESISTORS)
The measurement of high value resistances at the NPL --- electrical resistance
[NPL-DES-81] N85-33291

POWDER (PARTICLES)
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301

POWER AMPLIFIERS
Methods of reliability design of semiconductor power devices N85-33365

POWER EFFICIENCY
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703
Determination of DTL configurations
[DE85-010714] N85-33719

POWER SPECTRA
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33398

POWER SUPPLIES
Photovoltaic industry progress through 1984
[DE85-013029] N85-33596

POWER TRANSMISSION
Superconducting magnetic energy storage for asynchronous electrical systems
[DE85-005986] N85-33832

PRASEODYMIUM
Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
PRECAMBRIAN PERIOD
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
PRECIPITATION (METEOROLOGY)
Monthly and seasonal weather outlook for April 1985, March 30, 1985, volume 39, no. 7
[PB85-183804] N85-33646
PRECISION
Precision linear ramp function generator
[DE85-011647] N85-33304
PREDICTION ANALYSIS TECHNIQUES
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements
[AD-A155355] N85-33281
Predicting electrical performance parameters of underwater cables N85-33391
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements
[NOAA-TR-NESDIS-23] N85-33626
Global environmental transport models for tritium
[DE85-011437] N85-33639
PREDICTIONS
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854
PREMIXED FLAMES
Comments on two matters related to turbulent combustion N85-33204
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Modeling of turbulent recirculating combusting flows N85-33212
PREPARATION
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
PRESERVING
Use of gamma radiation as a form of preservation of sweet potatoes
[DE85-011998] N85-33787
PRESSURE
X-ray spectroscopy of solids under pressure
[DE85-011486] N85-33213
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
Adiabatic thermal models for planetary bodies N85-33881
PRESSURE DISTRIBUTION
Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112
PRESSURE GRADIENTS
Pressure correlations in turbulent reacting flows N85-33205
Second order modelling in non-constant density flows N85-33206
PRESSURE HEADS
Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595
PRESSURE PULSES
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
PRESSURE VESSEL DESIGN
Reactor pressure vessel steels ASME SA533B and SA508 C 1.2
[VTT-340] N85-33507
PRESSURE VESSELS
Slideline verification for multilayer pressure vessels and piping analysis including strain hardening
[DE85-005816] N85-33549
Prestressed concrete vessel according to the hot liner concept: A critical evaluation of experimental results with a prototype vessel
[OEFZS-4313] N85-33550
PRESSURIZED CABINS
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683
PRIMARY BATTERIES
Safety characteristics of non-lithium battery systems
[AD-A155733] N85-33574
PRIMARY COSMIC RAYS
The inner granulometric density of the tracks in nuclear emulsions and its application to determine the chemical spectrum of primary cosmic ray nuclidi
[OG-4.3-9] N85-34034
Observations of ultraheavy cosmic ray particles at 10 GV cutoff rigidity
[OG-4.4-2] N85-34035
Primary cosmic ray spectrum in the 10 to the 12th power - 10 to the 16th power eV energy range from the NUSEX experiment
[OG-5.1-5] N85-34047
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field
[OG-5.1-9] N85-34051
A new method to determine the chemical composition of the cosmic rays beyond 10 to the 15th power eV
[OG-5.1-11] N85-34052
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
Implication of EAS data for the study of primary cosmic rays above 10 to the 5th power GeV
[OG-5.2-7] N85-34064
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
PRIMITIVE EQUATIONS
An algorithm for the generation of primitive polynomials
[FUB-17-1984] N85-33730
PRINTED CIRCUITS
Heat sinking for printed circuitry
[DE85-011585] N85-33440
PRINTERS (DATA PROCESSING)
Dual optical mechanical position tracker
[AD-D011739] N85-33811
PRINTING
Ink jet printing of silver metallization for photovoltaics
[NASA-CR-176054] N85-33569
PROBABILITY DENSITY FUNCTIONS
Efficiency of discrimination in some invariant signal transformations N85-33399
PROBABILITY THEORY
Probabilistic analysis of automatic control systems for detection systems N85-33335
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724
A formulation and analysis of combat games
[NASA-TP-2487] N85-33745
PROBLEM SOLVING
Flat is not necessarily good
[DE85-012819] N85-33723
Implementing linear multistep formulas for solving DAES
[DE85-012400] N85-33740
PROCEDURES
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
PROCESS HEAT
Fuel cell applications literature review
[DE85-011891] N85-33592
Solar central receiver preliminary design studies: Summary and review of contract results
[DE85-011385] N85-33593
PROCUREMENT
Lopez Energy Alternatives Project
[DE85-010589] N85-33837
PRODUCT DEVELOPMENT
On the relationship between electronics and chemistry
[DRIC-T-7480] N85-33200
Automatic rotary valve actuator
[DE85-012797] N85-33505
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515
Drag-compensated, precision-powered hinge system N85-33517
Design and development of a linear thermal actuator N85-33518
The design and development of a constant-speed solar array drive N85-33519
The design and development of a spacecraft appendage tie down mechanism N85-33522
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564
Photovoltaics technical information guide
[DE85-002924] N85-33585
User commands for product design and system management
[DE85-011708] N85-33721
PRODUCTION
Preparation and use of very pure o-D2
[DE85-009415] N85-33800
PRODUCTION ENGINEERING
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197
PRODUCTION MANAGEMENT
Standard series of direct-current motors for regulated electric drives N85-33375
PRODUCTIVITY
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658
PROGRAMMING LANGUAGES
Logical and physical modeling and design of scientific and statistical databases for energy research
[DE85-006081] N85-33737
PROJECT MANAGEMENT
The 2nd World Meteorological Association Regional Association (Asia), 8th session
[WMO-642] N85-33643
PROJECTILES
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
PRONE POSITION
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672
PROPELLER BLADES
Two-plane balance and slip-ring design N85-33536
PROPORTIONAL COUNTERS
Wide-ranging radiation dose monitor
[DE85-011596] N85-33463
PROPULSION SYSTEM CONFIGURATIONS
Advanced beamed-energy and field propulsion concepts
[NASA-CR-176108] N85-33186
PROTECTIVE COATINGS
Rationale in the selection of corrosion protective coating systems N85-33242
Protective systems and maintenance policies for marine environments N85-33245
PROTOCOL (COMPUTERS)
Satellite links in the ISO architecture: Models and performance evaluation
[ENST-84E017] N85-33264
Petcom: A software instrument for the analysis of Petri networks, oriented towards communication protocols
[FUB-50-1983] N85-33266
PROTON BEAMS
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
PROTON DENSITY (CONCENTRATION)
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
PROTON-PROTON REACTIONS
Secondary antiproton production in relativistic plasmas
[OG-6.1-4] N85-34095
PROTONS
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789

Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
Primary cosmic ray spectrum in the 10 to the 12th power - 10 to the 16th power eV energy range from the NUSEX experiment
[OG-5.1-5] N85-34047
Composition of primary cosmic rays at energies 10(15) to approximately 10(16) eV
[OG-5.2-4] N85-34061
Electron and muon parameters of EAS and the composition of primary cosmic rays in 10(15) to approximately 10(16) eV
[OG-5.2-12] N85-34068
Anisotropy of cosmic rays above 10(14) eV
[OG-5.4-11] N85-34088
A model for the proton spectrum and cosmic ray anisotropy
[OG-5.4-12] N85-34089
Interpretation of cosmic-ray anisotropy below 10(14) eV
[OG-5.4-13] N85-34090

PROTOPLANETS
Late-stage planetesimals: How big? N85-33857
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864

PSEUDORANDOM SEQUENCES
An algorithm for the generation of primitive polynomials
[FUB-17-1984] N85-33730

PSYCHOLINGUISTICS
Speech analysis system for assessing pilots' working fitness N85-33661

PSYCHOMOTOR PERFORMANCE
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699

PSYCHOPHYSIOLOGY
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Psychophysiological distinctions of organization and regulation of daily cyclograms of crew activities during long-term spacecraft N85-33669
Operator's functional comfort zone when controlling moving object N85-33670

PULSARS
Comments on RS-17 X-ray telescope N85-33132
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range
[OG-2.2-10] N85-33936
Experimental results on gamma-ray sources at E sub 0 = 10(13) - 10(14) eV
[OG-2.2-12] N85-33937
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940
Microburst of TeV gamma rays from the Crab pulsar
[OG-2.3-4] N85-33941
Secondary periodicities of microbursts of TeV gamma rays from the Crab pulsar
[OG-2.3-5] N85-33942
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
The 1000 GeV gamma ray emission from radio pulsars N85-33946
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948
A search in the COS-B data base for correlated time variability in regions containing objects of interest
[OG-2.5-9] N85-33964
The 4U 0115+63: Another energetic gamma ray binary pulsar
[OG-2.6-11] N85-33973
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
Cosmic rays in the 10(16) to 10(19) eV range from pulsars
[OG-5.4-3] N85-34080

PULSE CHARGING
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313

PULSE COMMUNICATION
Optimum predistortion of digital signals for transmission over parallel channels N85-33397

PULSE DURATION
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Method of designing digital band-pass filters with pulse response of finite duration N85-33395
The 1000 GeV gamma ray emission from radio pulsars N85-33946

PULSE GENERATORS
Capacitance measuring device
[DE85-011643] N85-33460

PULSE RADAR
Characteristics of digital range finder with stroboscopic discretization N85-33319
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324

PULSED LASERS
Sliding discharge in CO2 and excimer lasers N85-33379
Pulsed lasers for filming color holographic film images N85-33426
Metal vapor lasers and their applications
[ISL-CO-218/84] N85-33488

PULSED RADIATION
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
The 1000 GeV gamma ray emission from radio pulsars N85-33946
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947

PULSES
Amplitude stabilization of pulse signals N85-33320
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924

PUMPS
An analysis of the effects of active solar energy system control sensor degradation on system performance
[DE84-013023] N85-33562

PURIFICATION
New and revised methods of purifying mercuric iodide
[DE85-011684] N85-33237

PURITY
Monosilane and disilane, 1984 report
[DE85-008776] N85-33262

PYROLYSIS
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193

PYRROLES
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity
[DE85-011602] N85-33258

Q

QUADRATIC PROGRAMMING
Model building and practical aspects of nonlinear programming
[AD-A155720] N85-33711

QUADRUPOLES
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794

QUALIFICATIONS
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119

QUALITY
The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125

QUALITY CONTROL
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244

QUANTITATIVE ANALYSIS
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301

QUANTUM CHROMODYNAMICS
Quark structure of nuclei
[DE85-010781] N85-33795

QUANTUM ELECTRONICS
Conferences of quantum-radiooptics section N85-33380

QUARKS
Heavy quarks and CP: Moriond 1985
[DE85-010553] N85-33790
Quark structure of nuclei
[DE85-010781] N85-33795

QUARTZ
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193

QUASARS
Cosmic gamma rays from quasars
[OG-2.7-10] N85-33983
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985

R

RADAR
Power density and threshold control strategies for radar track initiation
[AD-A155357] N85-33282

RADAR DETECTION
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324

RADAR EQUIPMENT
High-power solid-state rf source for accelerator cavities
[DE85-012672] N85-33309
Radar wind profilers in the Colorado network
[PB85-185486] N85-33647

RADAR GEOLOGY
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884

RADAR IMAGERY
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time N85-33384

RADAR TARGETS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Method of static measurements of absolute scattering matrix of radar targets N85-33316
Selectivity of weight compensator of passive interference to unknown velocities of detectable targets N85-33317
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322

RADIAL DISTRIBUTION
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data
[OG-3.1-5] N85-33993
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994

RADIANT FLUX DENSITY
Gamma-ray line intensities for depleted uranium
[DE85-012674] N85-33804
Search for excess showers from Crab Nebula
[OG-2.3-2] N85-33939
The 1000 GeV gamma ray emission from radio pulsars N85-33946
Cosmic gamma rays from quasars
[OG-2.7-10] N85-33983
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Radial distribution of cosmic ray intensity in the galaxy from gamma-ray data
[OG-3.1-5] N85-33993
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra
[OG-3.1-7] N85-33995

Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101

RADIATION DAMAGE
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833

RADIATION DETECTORS
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300
Beta response of selected instruments
[DE85-013278] N85-33469
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
Relative abundances of elements (20 or = Z or = 28) at energies up to 70 GeV/amu using relativistic rise in ion chambers
[OG-4.1-7] N85-34013

RADIATION DISTRIBUTION
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002

RADIATION DOSAGE
Wide-ranging radiation dose monitor
[DE85-011596] N85-33463
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
Error evaluation in measurements with thermoluminescent dosimeters
[ISS-T-84/6] N85-33471
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
Global environmental transport models for tritium
[DE85-011437] N85-33639
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
Long-term exposure of (238) PuO2 to a terrestrial environment, volume 3
[DE85-011896] N85-33781
Microdosimetric spectra measurements of JANUS neutrons
[DE85-012108] N85-33801

RADIATION EFFECTS
Tritium-helium effects in metals
[DE85-011507] N85-33235
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
Use of gamma radiation as a form of preservation of sweet potatoes
[DE85-011998] N85-33787

RADIATION HARDENING
Radiation-hardened polymeric films
[DE85-011636] N85-33259

RADIATION HAZARDS
ARAC status report, 1985
[DE85-012835] N85-33603
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765

RADIATION MEASUREMENT
Results from Astron orbiting telescope N85-33134
Wide-ranging radiation dose monitor
[DE85-011596] N85-33463
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786

RADIATION MEASURING INSTRUMENTS
Wide-ranging radiation dose monitor
[DE85-011596] N85-33463
Beta response of selected instruments
[DE85-013278] N85-33469
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067

RADIATION PROTECTION
ARAC status report, 1985
[DE85-012835] N85-33603

RADIATION SHIELDING
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817

RADIATION SOURCES
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
Optical monitoring of gamma-ray source fields
[OG-1.1-7] N85-33908
Search for optical bursts from the gamma ray burst source GBS 0526-66
[OG-1.1-8] N85-33909
Search for infrared counterparts of gamma-ray bursters
[OG-1.1-9] N85-33910
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network
[OG-1.2-1] N85-33912
Gamma ray burst size-frequency distributions: Spectral selection effects
[OG-1.2-3] N85-33913
An internally consistent gamma ray burst time history phenomenology
[OG-1.2-6] N85-33916
Relationships between log N-log S and celestial distribution of gamma-ray bursts
[OG-1.2-10] N85-33918
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920
Muon content of gamma ray induced EAS from Cygnus X-3
[OG-2.1-4] N85-33921
Gamma rays of energy or = 10(15) eV from Cyg X-3
[OG-2.1-5] N85-33922
Experimental results on gamma-ray sources at E sub 0 = 10(13) - 10(14) eV
[OG-2.2-12] N85-33937
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
Search for periodicities near 59 s in the COS-B gamma-ray data of 2CG195+04 (Geminga)
[OG-2.4-3] N85-33950
On the 1983 observations of the gamma-ray source 2CG195+4
[OG-2.4-5] N85-33952
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
Galactic gamma-ray sources, SNOBs, and giant H2 regions
[OG-2.5-4] N85-33961
Observations of potential ultra high energy gamma-ray sources above 10(15) eV
[OG-2.6-9] N85-33971
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027

RADIATION SPECTRA
Solid state radiative heat pump
[DE85-011605] N85-33303
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
[OG-2.4-9] N85-33954
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107

RADIATION TRANSPORT
Global environmental transport models for tritium
[DE85-011437] N85-33639
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776
Long-term exposure of (238) PuO2 to a terrestrial environment, volume 3
[DE85-011896] N85-33781
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103

RADIATIVE RECOMBINATION
Recombination and ionization in a nitrogen plasma
[AD-A155426] N85-33813

RADII
Automatic sphericity interferometer for testing lens radii
[AD-A155736] N85-33457

RADIO ASTRONOMY
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847

RADIO DIRECTION FINDERS
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318

RADIO EMISSION
Analysis of Jovian decametric data: Study of radio emission mechanisms
[NASA-CR-176057] N85-33846
Observations of potential ultra high energy gamma-ray sources above 10(15) eV
[OG-2.6-9] N85-33971
The 4U 0115+63: Another energetic gamma ray binary pulsar
[OG-2.6-11] N85-33973
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102

RADIO FREQUENCIES
Analysis of solution of Bloch's equations in time domain N85-33371
Rf program for LAMPF 2
[DE85-012693] N85-33760
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
Radio observations of four anticenter 2CG gamma-ray sources
[OG-2.5-10] N85-33965

RADIO OCCULTATION
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847

RADIO RECEIVERS
Optimality criterion for high-frequency channel in receivers of discrete radio signals N85-33401
Synthesis of system with nonideal components for optimal processing of radio signal N85-33405
Developmental trends in radio receiver design N85-33407

RADIO SIGNALS
Synthesis of system with nonideal components for optimal processing of radio signal N85-33405

RADIO SOURCES (ASTRONOMY)
Comments on RS-17 X-ray telescope N85-33132
Radio observations of four anticenter 2CG gamma-ray sources
[OG-2.5-10] N85-33965
A search for sources of ultra high energy gamma rays at air shower energies with Ooty EAS array
[OG-2.6-8] N85-33970
Search for the gamma-ray fluxes with energies above 10915) eV from various objects
[OG-2.6-14] N85-33975
CEN A observation at MeV-energies
[OG-2.7-7] N85-33980

RADIO SPECTRA
Controllable companding in low-frequency FM radio communication systems N85-33402

RADIO STARS
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948

RADIO TELESCOPES
Radio telescope with 256 antennas built in Siberia N85-33136

RADIO TRACKING
Synthesis of adaptive filters for tracking radio systems N85-33325

RADIO TRANSMISSION
Effects of hydrometeors on electromagnetic wave propagation
[AD-A155379] N85-33297
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327

RADIO WAVES
Radio telescope with 256 antennas built in Siberia N85-33136

RADIOACTIVE CONTAMINANTS
ARAC status report, 1985
[DE85-012835] N85-33603
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1983
[CISE-2515] N85-33617

RADIOACTIVE DECAY
Tritium-helium effects in metals
[DE85-011507] N85-33235

RADIOACTIVE ISOTOPES
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766

RADIOACTIVE WASTES
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
ARAC status report, 1985
[DE85-012835] N85-33603
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771
Office of Civilian Radioactive Waste Management
[DE85-012585] N85-33774
Polyethylene solidification of low-level wastes
[DE85-012568] N85-33799

RADIOACTIVITY
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607

RADIOMETERS
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Determination of altitude of cloud cover top from Meteor satellite data N85-33150

RADIOTELEPHONES
Controllable companding in low-frequency FM radio communication systems N85-33402

RAIL TRANSPORTATION
Fuel cell applications literature review
[DE85-011891] N85-33592

RAILGUN ACCELERATORS
A method of accurizing rail guns
[LA-10028-MS] N85-33166
Use of the computer programs PARA 80 to study results from firing the railgun ERGS-1M
[MRL-R-900] N85-33187
Generation of round bores in composite structure railguns
[DE85-011872] N85-33501

RAMAN SPECTRA
Measurement of velocity and concentration in free jets
[ISL-CO-215/84] N85-33451

RAMAN SPECTROSCOPY
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218

RAMP FUNCTIONS
Precision linear ramp function generator
[DE85-011647] N85-33304

RANDOM ACCESS MEMORY
Microcomputer controlled image processor
[AD-D011734] N85-33735
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833

RANDOM NOISE
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324

RANDOM NUMBERS
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742

RANDOM SIGNALS
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323

RANDOM WALK
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743

RANGE FINDERS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Characteristics of digital range finder with stroboscopic discretization N85-33319

RARE GASES
Terrestrial Planets: Comparative Planetology
[NASA-CR-176093] N85-33849
Noble gases in meteorites and terrestrial planets N85-33850
Relationships between chondritic meteorites and planets N85-33851
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853
Impact processes and their implications for planetary formation and early evolution N85-33860

RATES (PER TIME)
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
Cyg X-3: Not seen in high-energy gamma rays by COS-B
[OG-2.2-2] N85-33929
Constraints on cosmic-ray observation of Cygnus X-3
[OG-2.2-3] N85-33930
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935

RATS
General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite N85-33679
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681

RAYLEIGH DISTRIBUTION
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925

RDX
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223

REACTION KINETICS
Jet flows: Modelling and experiments N85-33208
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays
[DE85-012730] N85-33722
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864

REACTION PRODUCTS
Current regulatory and licensing status for byproduct sources, facilities and applications
[DE85-010967] N85-33796

REACTION TIME
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338

REACTIVITY
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270

REACTOR DESIGN
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
Fusion Power Demonstration (FPD) maintenance and disassembly considerations
[DE85-011413] N85-33820
Blanket optimization studies for Cascade
[DE85-010002] N85-33824

REACTOR MATERIALS
Tritium-helium effects in metals
[DE85-011507] N85-33235
Reactor pressure vessel steels ASME SA533B and SA508 C 1.2
[VTT-340] N85-33507
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776

READ-ONLY MEMORY DEVICES
Microcomputer controlled image processor
[AD-D011734] N85-33735

READOUT
Digital tachometer N85-33416

REAL TIME OPERATION
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
Modeling and measurement of fault-tolerant multiprocessors
[NASA-CR-3920] N85-33732
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899

RECEIVERS
Sensitivity of compressive receivers
[FOA-C-30385-E4] N85-33288
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
Binary signal detection in acoustooptic receivers N85-33430

RECIRCULATIVE FLUID FLOW
Modeling of turbulent recirculating combusting flows N85-33212

RECOMMENDATIONS
Fire protection review revisit no. 2, Argonne National Laboratory, Argonne, Illinois
[DE85-013245] N85-33276
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466

RED SHIFT
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987
REDUCED GRAVITY
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
REENTRY VEHICLES
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
REFINING
Experimental studies of glass refining
[NASA-CR-176130] N85-33248
REFLECTANCE
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Fiber optic moisture sensor
[DE85-011651] N85-33462
REFLECTED WAVES
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
REFLECTION
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
REFLECTORS
Method of constructing folding umbrella-type antenna N85-33386
Hoop/column antenna deployment mechanism overview N85-33514
REFRACTION
Refraction of narrow probing light beam in multilayer optical fiber N85-33330
REFRACTIVITY
Refraction of narrow probing light beam in multilayer optical fiber N85-33330
Temperature sensitivity of fiber-optic transmission line N85-33331
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4
[DE85-012968] N85-33831
REFRACTORY MATERIALS
Welding methods for high melting metals N85-33508
REFRIGERATING
Evaluation study of mechanical refrigeration systems for application to space missions --- infrared astronomy
[SNIAS-1029ACA/LL/V] N85-33277
Heat-mass flow enhancement system for a metal hydride assembly
[DE85-010698] N85-33441
REGENERATION (PHYSIOLOGY)
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684
Experimental validation of allowable concentrations of sodium and potassium in recycled drinking water N85-33685
REGOLITH
Interpretation of photometric measurements of airless bodies N85-33871
REGRESSION ANALYSIS
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
REGULATIONS
Current regulatory and licensing status for byproduct sources, facilities and applications
[DE85-010967] N85-33796
REINFORCING FIBERS
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
RELATIVISTIC ELECTRON BEAMS
Further studies of X-ray structure of the Perseus cluster
[OG-2.5-12] N85-33967
RELATIVISTIC PARTICLES
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110
RELATIVISTIC PLASMAS
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985
Secondary antiproton production in relativistic plasmas
[OG-6.1-4] N85-34095
RELAXATION (MECHANICS)
Recent advances in d-c relaxation techniques for the measurement of kinetics of fast electrode reactions
[DE85-005029] N85-33216
RELIABILITY
Methods of reliability design of semiconductor power devices N85-33365
Photovoltaics technical information guide
[DE85-002924] N85-33585
CARE 3 MENU maintenance manual
[NASA-CR-172609] N85-33708
REMOTE CONTROL
Space robot simulator vehicle
[NASA-CR-176133] N85-33176
Remote temperature-set-point controller
[DE85-011614] N85-33459
Telepresence work system concepts N85-33525
Dual arm master controller development N85-33526
REMOTE HANDLING
Latch assembly
[DE85-011660] N85-33492
Portable cutting apparatus
[DE85-011635] N85-33496
Future of robots in nuclear plants and processes
[DE85-011505] N85-33500
Telepresence work system concepts N85-33525
Dual arm master controller development N85-33526
REMOTE MANIPULATOR SYSTEM
Telepresence work system concepts N85-33525
REMOTE SENSING
Cosmonauts participate in multilevel remote sensing experiment N85-33130
Spacecraft-aided research discussed at geology Congress N85-33147
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
REMOTELY PILOTED VEHICLES
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
REMOVAL
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191
REPETITION
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
REPORTS
National Center for Atmospheric Research
[PB85-191237] N85-33835
NBS (National Bureau of Standards) library serial holdings, 1985
[PB85-191948] N85-33839
RESCUE OPERATIONS
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114
RESEARCH
Energy efficient transport technology: Program summary and bibliography
[NASA-RF-1135] N85-33116
National Center for Atmospheric Research
[PB85-191237] N85-33835
RESEARCH AND DEVELOPMENT
Management of Corrosion
[AGARD-LS-141] N85-33238
Photovoltaics technical information guide
[DE85-002924] N85-33585
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588
RESEARCH FACILITIES
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
RESERVES
AUTSKED: An addendum
[DE85-010410] N85-33712
RESERVOIRS
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
RESIDENTIAL ENERGY
Solid desiccant dehumidification systems for residential applications
[PB85-198489] N85-33279
RESIDUAL STRESS
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions
[NASA-CR-176147] N85-33545
RESONANCE
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755
Accelerator vibration issues
[DE85-010766] N85-33791
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
RESONANT FREQUENCIES
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543
RESONATORS
Miniature two-mode filters N85-33394
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
RESOURCES
Arctic and offshore research
[DE85-001995] N85-33653
RESOURCES MANAGEMENT
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
RESPIRATION
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
RESPIRATORY SYSTEM
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
RETINA
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686
RETROREFLECTION
Transparent electrode for optical switch
[DE85-011618] N85-33310
REVERSE OSMOSIS
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
REVERSING
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
REVISIONS
AUTSKED: An addendum
[DE85-010410] N85-33712
REYNOLDS EQUATION
Turbulent mixing and combustion N85-33207
RHEOLOGY
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
A solid-state framework for terrestrial upper mantles N85-33678
RIEMANN MANIFOLD
Admissible convergence of Poisson integrals in symmetric spaces
[CTH-MATH-1985-04] N85-33750

RIGID STRUCTURES
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels
[NASA-TP-2480] N85-33537
RING STRUCTURES
A rotating electrical transfer device N85-33529
Two-plane balance and slip-ring design N85-33536
RISK
Procedure for estimating orbital debris risks
[NASA-TP-2507] N85-33169
RIVER BASINS
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1963
[CISE-2515] N85-33617
ROBOTICS
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations
[NASA-TM-87496] N85-33173
Statement of Aaron Cohen, Director, Research and Engineering, Johnson Space Center and Chairman, Space Station Advanced Technology Advisory Committee, National Aeronautics and Space Administration, before the Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, United States Senate
[NASA-TM-87497] N85-33174
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
Study and realization of a command system adapted to space robotics
[SNIAS-851-440-106] N85-33183
Robotic order picking
[AD-D011737] N85-33493
Machine intelligence for robotics applications
[DE85-011430] N85-33503
A strategy planner for NASA robotics applications
[NASA-CR-175319] N85-33738
ROBOTS
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
Space robot simulator vehicle
[NASA-CR-176133] N85-33176
Study and realization of a command system adapted to space robotics
[SNIAS-851-440-106] N85-33183
Latch assembly
[DE85-011660] N85-33492
Future of robots in nuclear plants and processes
[DE85-011505] N85-33500
Research on distributed artificial intelligence
[AD-A155356] N85-33733
ROCKET ENGINES
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
ROCKS
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
Discontinuous deformation analysis
[DE85-011208] N85-33628
ROLLERS
A rotating electrical transfer device N85-33529
ROLLING CONTACT LOADS
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491
The properties of thin-section, four-point-contact ball bearings in space N85-33521
ROOT-MEAN-SQUARE ERRORS
1000 GeV gamma rays from Cygnus X-3: An update
[OG-2.1-8] N85-33925
ROSAT MISSION
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
ROTARY WING AIRCRAFT
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111
ROTATING BODIES
A rotating electrical transfer device N85-33529
ROTATION
Automatic rotary valve actuator
[DE85-012797] N85-33505
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
ROVING VEHICLES
Mars landing sites N85-33893
RUN TIME (COMPUTERS)
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer
[DE85-013260] N85-33726
RUNWAY CONDITIONS
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114
RUTHENIUM
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610

S

S MATRIX THEORY
Method of static measurements of absolute scattering matrix of radar targets N85-33316
Interrelations for the elements of the scattering matrix N85-33872
SAFETY
Safety characteristics of non-lithium battery systems
[AD-A155733] N85-33574
SALINITY
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
SALT BEDS
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557
SALTS
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263
SALYUT SPACE STATION
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
Vatra telvision complex for Salyut orbital space station N85-33321
SAMPLERS
Soil extraction kit
[AD-D011736] N85-33190
SAMPLING
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
SATELLITE ATMOSPHERES
Extended atmospheres of outer planet satellites and comets
[NASA-CR-176137] N85-33848
SATELLITE IMAGERY
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
Physico-geographical regionalization of Caspian lowland based on space survey materials N85-33162
Repetition of dense cloud cover above Indian Ocean from generalized satellite data N85-33165
SATELLITE INSTRUMENTS
Six mechanisms used on the SSM/1 radiometer N85-33534
SATELLITE NETWORKS
International prototype network in Dubna experimental satellite communications system N85-33383
SATELLITE OBSERVATION
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
SATELLITE ORBITS
Spacecraft-aided research discussed at geology Congress N85-33147
SATELLITE-BORNE INSTRUMENTS
Spacecraft-aided research discussed at geology Congress N85-33147
SATELLITE-BORNE PHOTOGRAPHY
Spacecraft-aided research discussed at geology Congress N85-33147
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
SATELLITES
Fuel cell applications literature review
[DE85-011891] N85-33592
SATURN (PLANET)
Extended atmospheres of outer planet satellites and comets
[NASA-CR-176137] N85-33848
SCALARS
Vortex dynamics simulation of conserved scalar dissipation N85-33210
SCALING LAWS
Soil extraction kit
[AD-D011736] N85-33190
Magnetic field generation in the cores of terrestrial bodies N85-33894
SCANDIUM
The isotopic composition of cosmic ray calcium
[OG-4.3-5] N85-34030
SCANNERS
Six mechanisms used on the SSM/1 radiometer N85-33534
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
SCATTERING
Interpretation of photometric measurements of airless bodies N85-33871
SCATTERING CROSS SECTIONS
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
SCATTERING FUNCTIONS
Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429
SCENE ANALYSIS
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
SCHEDULING
Deficit irrigation feasibility study and demonstration project
[DE85-011531] N85-33555
SCHOTTKY DIODES
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
SCHROEDINGER EQUATION
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789
SCHUMANN-RUNGE BANDS
Determination of band oscillator strengths of atmospheric molecules from high resolution vacuum ultraviolet cross section measurements
[NASA-CR-176150] N85-33624
SCHWARTZ INEQUALITY
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739
SCIENTISTS
Harold Hazen and the theory and design of servomechanism
[RR-270] N85-33506
SCINTILLATION
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
SCINTILLATION COUNTERS
Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
SCRUBBERS
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
SEA ICE
Arctic and offshore research
[DE85-001995] N85-33653
SEA LEVEL
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
SEA WATER
Determination of organobromide compounds in water by gas chromatography-negative ion chemical ionisation mass spectrometry
[DRIC-T-7411] N85-33199
SEALING
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263

SEALS (STOPPERS)
Mechanical connection for a tubular assembly
[DE85-011590] N85-33497
SEATS
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515
SECONDARY COSMIC RAYS
The isotopic composition of cosmic ray chlorine
[OG-4.3-3] N85-34028
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094
Secondary antiproton production in relativistic plasmas
[OG-6.1-4] N85-34095
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
SEDIMENTARY ROCKS
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635
SEDIMENTS
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634
SEISMIC ENERGY
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724
SEISMOLOGY
Tectonic stability and expected ground motion at Yucca Mountain
[DE85-012004] N85-33629
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724
SELECTION
Robotic order picking
[AD-D011737] N85-33493
SELECTIVITY
Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
SELENIUM
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
SELF ERECTING DEVICES
Hoop/column antenna deployment mechanism overview N85-33514
SEMANTICS
Research on distributed artificial intelligence
[AD-A155356] N85-33733
SEMICONDUCTOR DEVICES
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
Thermoelectric generator and method for the fabrication thereof
[DE85-011650] N85-33302
Solid state radiative heat pump
[DE85-011605] N85-33303
Electron beam enhanced surface modification for making highly resolved structures
[DE85-011609] N85-33305
TEMO and TEB thermoelectronic devices N85-33415
Transient two-dimensional simulation of SEU in a CMOS SRAM cell
[DE85-008419] N85-34111
SEMICONDUCTORS (MATERIALS)
Consortium program for the study of boron-rich borides
[DE85-011378] N85-33260
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
Photovoltaics technical information guide
[DE85-002924] N85-33585
SENSITIVITY
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Sensitivity of compressive receivers
[FOA-C-30385-E4] N85-33288
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Design of inductive shift transducers N85-33368
Selecting step sizes in sensitivity analysis by finite differences
[NASA-TM-86382] N85-33538
Experimental test for interpreting the increase in sensibility of doped CR-39
[OG-4.4-11] N85-34042
SENSORS
Electrochemical methane sensor
[DE85-011663] N85-33464
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470
Electronic temperature equalizer
[PB85-181485] N85-33475
Durability of oxygen sensors
[PB85-183093] N85-33477
SEPARATED FLOW
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N65-33110
SEPARATION
Dual optical mechanical position tracker
[AD-D011739] N85-33811
SEPARATORS
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Development of a prototype energy meter
[PB85-198430] N85-33476
Molten carbonate fuel cell separator
[DE85-011615] N85-33577
SERIES (MATHEMATICS)
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
SERVOMECHANISMS
Harold Hazen and the theory and design of servomechanism
[RR-270] N85-33506
Application of traction drives as servo mechanisms N85-33520
Dual arm master controller development N85-33526
SEYFERT GALAXIES
Balloon observations of hard X-rays from NGC 4151 and an X-ray transient source
[OG-2.7-6] N85-33979
Gamma-radiation with E gamma 5 MeV detected from Seyfert galaxy 3C120 and region with 1' = 190 deg and b' = 20 deg
[OG-2.8-8] N85-33981
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
SHADOWS
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field
[OG-5.1-9] N85-34051
SHAPES
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106
SHEAR FLOW
Second order modelling in non-constant density flows N85-33206
Turbulent mixing and combustion N85-33207
Modeling of turbulent recirculating combusting flows N85-33212
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
SHEAR LAYERS
Comments on two matters related to turbulent combustion N85-33204
SHEAR PROPERTIES
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
SHEEP
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
SHELTERS
SHELTER: Description of a program code — indoor climate
[FOA-C5-85-0002-H1] N85-33278
SHIELDING
Calculation of external magnetic field of a shielded transformer N85-33373
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
Removable cleanable antireflection shield
[AD-D011735] N85-33810
SHIPS
Fuel cell applications literature review
[DE85-011891] N85-33592
SHOCK ABSORBERS
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515
SHOCK LOADS
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
SHOCK TUBES
Experimental simulation of in-bore flows using a high pressure shock tube
[ISL-CO-217/84] N85-33452
SHOCK WAVES
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
SHORT TAKEOFF AIRCRAFT
Discussion of the paper, Some Aspects of Propulsion for the Augmenter-Wing Concept, by D. C. Whittley
[NASA-TM-77884] N85-33108
SHORT WAVE RADIATION
Developmental trends in radio receiver design N85-33407
SIDEREAL TIME
The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075
SIGNAL ANALYSIS
Synthesis of adaptive filters for tracking radio systems N85-33325
SIGNAL ANALYZERS
Transmitter spectrum analyzer N85-33389
SIGNAL DETECTION
Selectivity of weight compensator of passive interference to unknown velocities of detectable targets N85-33317
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324
Efficiency of discrimination in some invariant signal transformations N85-33399
Optimality criterion for high-frequency channel in receivers of discrete radio signals N85-33401
Binary signal detection in acoustooptic receivers N85-33430
SIGNAL DISTORTION
An image compression survey and algorithm switching based on scene activity
[NASA-TP-2458] N85-33106
Optimum predistortion of digital signals for transmission over parallel channels N85-33397
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
SIGNAL PROCESSING
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Signal processing in quasi-holographic system as an inverse problem N85-33315
Method of static measurements of absolute scattering matrix of radar targets N85-33316
Characteristics of digital range finder with stroboscopic discretization N85-33319
Amplitude stabilization of pulse signals N85-33320
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327
Adaptive synthesis of antennas with separation of signals by direction of arrival N85-33328
Probabilistic analysis of automatic control systems for detection systems N85-33335
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338

Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361
Design of digital bandpass filters with finite memory N85-33392
Method of designing digital band-pass filters with pulse response of finite duration N85-33395
Generalization of discrete Fourier transform for interpolation in time domain N85-33396
Generalization of discrete Fourier transformation for interpolation in time domain N85-33400
Controllable companding in low-frequency FM radio communication systems N85-33402
Synthesis of system with nonideal components for optimal processing of radio signal N85-33405
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417
Methods for the optical processing of signals [DRIC-T-7439] N85-33809

SIGNAL TO NOISE RATIOS
Sensitivity of compressive receivers [FOA-C-30385-E4] N85-33288
Adaptive corrector operating in frequency domain N85-33337
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33398

SIGNAL TRANSMISSION
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338
Digital matched filter N85-33339
Optimum predistortion of digital signals for transmission over parallel channels N85-33397
Photothyristor optrons and optron microcircuits, part 1 N85-33424
Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429

SIGNS AND SYMPTOMS
Labyrinthine and extralabyrinthine mechanisms of development of motion sickness in weightlessness N85-33668

SILANES
Monosilane and disilane, 1984 report [DE85-008776] N85-33262
1985 Amorphous Silicon Review Meeting [DE85-008794] N85-33582

SILICATES
Thermodynamic data for mineral technology [PB85-184331] N85-33560
Volatile loss following very large impacts N85-33862

SILICON
Cryogenic laser calorimetry for impurity analysis [NASA-CR-176102] N85-33201
Solid-melt interface studies of high-speed silicon sheet growth [NASA-CR-176112] N85-33249
Stress and efficiency studies in EFG [NASA-CR-176125] N85-33251
In-situ observations of the development of heavy-ion damage in semiconductors [DE85-010289] N85-33307
Method and apparatus for casting conductive and semi-conductive materials [DE85-011655] N85-33494
Development of high-efficiency solar cells on silicon web [NASA-CR-176101] N85-33568
Ultrasonic seam welding on thin silicon solar cells [NASA-CR-176116] N85-33570
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells [NASA-CR-176109] N85-33571
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573
1985 Amorphous Silicon Review Meeting [DE85-008794] N85-33582
Low-cost high-performance silicon concentrator cells [DE85-008875] N85-33584
Striation free doped silicon [AD-A155730] N85-33827
Apparatus and method for the horizontal, crucible-free growth of silicon sheet crystals [DE85-011588] N85-33829
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data [OG-4.3-6] N85-34031

SILICON ALLOYS
Development of improved thermoelectric materials for space nuclear power systems [DE85-013079] N85-33807

SILICON CARBIDES
Dispersion toughened ceramic composites and method for making same [DE85-011601] N85-33252
Woven heat exchanger [DE85-011633] N85-33439

SILICON COMPOUNDS
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572

SILICON DIOXIDE
Process for improving the quality of epitaxial silicon films grown on insulating substrates [AD-D011730] N85-33828

SILICON FILMS
Process for improving the quality of epitaxial silicon films grown on insulating substrates [AD-D011730] N85-33828

SILICON TRANSISTORS
KT3127A, KT3128A transistors N85-33414

SILVER
Method of bonding silver to glass and mirrors produced according to this method [DE85-011642] N85-33495
Ink jet printing of silver metallization for photovoltaics [NASA-CR-176054] N85-33569
Environmental surveillance at Los Alamos during 1984 [DE85-011886] N85-33605

SIMILARITY NUMBERS
Application of field similitude theory to calculation of stripline heating N85-33419

SIMULATION
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361
New formulation for linear accelerator design [DE85-011171] N85-33792
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres [NASA-CR-176078] N85-33847
Late-stage planetesimals: How big? N85-33857
A simulation of high energy cosmic ray propagation 2 [OG-5.4-2] N85-34079

SINGLE CRYSTALS
Microstructure-mechanical property relationships in the transformation-toughened ceramics [DE85-011946] N85-33261

SINGULAR INTEGRAL EQUATIONS
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422

SITE SELECTION
Fusion facility siting considerations [DE85-012894] N85-33805
Mars landing sites N85-33893

SITTING POSITION
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672

SKID LANDINGS
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982 [PB85-910406] N85-33114

SKIN (ANATOMY)
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice [AD-A155723] N85-33655

SKYLAB 3
Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment [OG-4.1-4] N85-34010

SLABS
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness [OEFZS-4312] N85-33762

SLIDING FRICTION
Rolling, slip and traction measurements on low modulus materials [NASA-CR-174909] N85-33491

SLOTS
Induction motors with minimum waste of magnetic iron N85-33377
Dual optical mechanical position tracker [AD-D011739] N85-33811

SLURRIES
Superheated fuel injection for combustion of liquid-solid slurries [DE85-011624] N85-33266
Drying of pulverized material with heated condensible vapor [DE85-011656] N85-33438

SMOG
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model [PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development [PB85-186492] N85-33619
Atmospheric reaction products from hazardous air pollutant degradation [PB85-185841] N85-33620

SOBOLEV SPACE
Some properties of Loeb-Sobolev spaces [CTH-MATH-1985-01] N85-33748

SODAR
Verification of Doppler sodar measurements — atmospheric boundary layer [KNMI-WR-85-2] N85-33645

SODIUM
Photoionization of alkali and alkaline earth atoms: Na and Mg [DE85-011812] N85-33755

SODIUM COMPOUNDS
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream [DE85-011357] N85-33214

SODIUM NITRATES
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating [DE85-011610] N85-33254

SODIUM SULFUR BATTERIES
Transfer of battery technology developed by the US Department of Energy [DE85-009868] N85-33588

SOFTWARE ENGINEERING
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer [DE85-013260] N85-33726

SOFTWARE TOOLS
Integrated Support Software System (ISSS) [AD-A155715] N85-33710

SOIL SCIENCE
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site [DE85-011209] N85-33611

SOILS
Soil extraction kit [AD-D011736] N85-33190
WIPP horizon in situ permeability measurements [DE85-012687] N85-33557
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area [PB85-192276] N85-33559
Environmental surveillance at Los Alamos during 1984 [DE85-011886] N85-33605
Global environmental transport models for tritium [DE85-011437] N85-33639
Arctic and offshore research [DE85-001995] N85-33653
Development of solid thorium-232 reference materials [DE85-011453] N85-33785

SOLAR ACTIVITY
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327

SOLAR ACTIVITY EFFECTS
Solar variability observed through changes in solar figure and mean diameter [DE85-012857] N85-33900

SOLAR ARRAYS
The design and development of a constant-speed solar array drive N85-33519
Features of the solar array drive mechanism for the space telescope N85-33532
Structural dynamics model and response of the deployable reference configuration space station [NASA-TM-86386] N85-33539
Surface voltage gradient role in high voltage solar array-plasma interaction: Center Director's discretionary fund [NASA-TM-86516] N85-33567
Photovoltaics technical information guide [DE85-002924] N85-33585

SOLAR CELLS
Solid-melt interface studies of high-speed silicon sheet growth [NASA-CR-176112] N85-33249
Block 5 documentation and solar modules [NASA-CR-176134] N85-33564
Laser-assisted solar cell metallization processing [NASA-CR-176124] N85-33565
Diffusion welding of Cassegrainian concentrator cell stack assemblies [NASA-CR-176104] N85-33566
Development of high-efficiency solar cells on silicon web [NASA-CR-176101] N85-33568
Ultrasonic seam welding on thin silicon solar cells [NASA-CR-176116] N85-33570
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells [NASA-CR-176109] N85-33571

An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
Photovoltaic energy systems [DE85-011630] N85-33581
1985 Amorphous Silicon Review Meeting [DE85-008794] N85-33582
Low-cost high-performance silicon concentrator cells [DE85-008875] N85-33584
Photovoltaics technical information guide [DE85-002924] N85-33585

SOLAR COLLECTORS
Department of Energy gear drive unit final prototype testing and design evaluation [DE85-003296] N85-33499
An analysis of the effects of active solar energy system control sensor degradation on system performance [DE84-013023] N85-33562
Theory of cellwise optimization for solar central receiver system [DE85-012586] N85-33579
Solar central receiver preliminary design studies: Summary and review of contract results [DE85-011385] N85-33593
Study of alternative system conversions for the Solar One pilot plant [DE85-010026] N85-33594
Long-term goals for solar thermal technology [DE85-013032] N85-33597

SOLAR COOLING
Solid desiccant dehumidification systems for residential applications [PB85-198489] N85-33279
Advances in open-cycle solid desiccant cooling [DE85-008797] N85-33590

SOLAR CORONA
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327
Relationships between chondritic meteorites and planets N85-33851
Nebular volatile fractionations associated with chondrule formation N85-33855
The distribution of compositional classes in the asteroid belt: A cosmochemical fingerprint? N85-33856

SOLAR CYCLES
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327

SOLAR DIAMETER
Solar variability observed through changes in solar figure and mean diameter [DE85-012857] N85-33900

SOLAR ENERGY
Failure testing of active solar energy system components [DE84-013024] N85-33561
An analysis of the effects of active solar energy system control sensor degradation on system performance [DE84-013023] N85-33562
Solar central receiver preliminary design studies: Summary and review of contract results [DE85-011385] N85-33593
Study of alternative system conversions for the Solar One pilot plant [DE85-010026] N85-33594

SOLAR ENERGY CONVERSION
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity [DE85-011602] N85-33258
Long-term goals for solar thermal technology [DE85-013032] N85-33597

SOLAR FLARES
Radio telescope with 256 antennas built in Siberia N85-33136

SOLAR FLUX
The polar caps and the climatic evolution of Mars N85-33866

SOLAR HEATING
Laser sealed evacuated window glazings [DE85-000512] N85-33273
Failure testing of active solar energy system components [DE84-013024] N85-33561
An analysis of the effects of active solar energy system control sensor degradation on system performance [DE84-013023] N85-33562
Lopez Energy Alternatives Project [DE85-010589] N85-33837

SOLAR MAGNETIC FIELD
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions [NASA-CR-176090] N85-33897
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field [OG-5.1-9] N85-34051

SOLAR OBSERVATORIES
Radio telescope with 256 antennas built in Siberia N85-33136

SOLAR OSCILLATIONS
Solar variability observed through changes in solar figure and mean diameter [DE85-012857] N85-33900

SOLAR POSITION
Terrain illumination conditions when taking scanning photographs from space N85-33159

SOLAR RADIATION
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Solar energy meteorological research and training program: Region 4 [DE85-011783] N85-33640

SOLAR REFLECTORS
Theory of cellwise optimization for solar central receiver system [DE85-012586] N85-33579

SOLAR SPECTRA
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra [AERONOMICA-ACTA-A-295-1985] N85-33623
Application of nonlinear least squares methods to the analysis of solar spectra [NASA-CR-176122] N85-33637

SOLAR SYSTEM
Program for observations of Halley's comet N85-33138
Relationships between chondritic meteorites and planets N85-33851
Nebular volatile fractionations associated with chondrule formation N85-33855
What determines the location of satellites and planets? N85-33858
Volatiles on satellites of the outer solar system N85-33868

SOLAR TERRESTRIAL INTERACTIONS
Solar energy meteorological research and training program: Region 4 [DE85-011783] N85-33640

SOLAR THERMAL ELECTRIC POWER PLANTS
Long-term goals for solar thermal technology [DE85-013032] N85-33597

SOLAR WIND
Yakutsk Institute's cosmic ray research facility N85-33135
Spectral measurements of magnetic energy and magnetic helicity between 0.29 and 0.97 AU [IFSI-85-2] N85-33844
Magnetotails of the terrestrial planets: A comparative study N85-33875
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions [NASA-CR-176090] N85-33897
Statistical analyses in the study of solar wind-magnetosphere coupling [DE85-009596] N85-33898

SOLAR WIND VELOCITY
Linear filters as a method of real-time prediction of geomagnetic activity [DE85-010760] N85-33899

SOLID ELECTROLYTES
Defect interactions at high concentrations in solid oxide electrolytes [DE85-011824] N85-33580

SOLID LUBRICANTS
Advances in sputtered and ion plated solid film lubrication N85-33524

SOLID SOLUTIONS
Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles [PB85-187961] N85-33453

SOLID STATE
A solid-state framework for terrestrial upper mantles N85-33878

SOLID STATE DEVICES
TEMO and TEB thermoelectronic devices N85-33415

SOLID STATE LASERS
Pulsed lasers for filming color holographic film images N85-33426
Trivalent cerium doped crystals as tunable laser systems: Two bad apples [DE85-008168] N85-33482

SOLID SURFACES
Effects of laser radiation on surfaces and coatings [DE85-010475] N85-33484

SOLID WASTES
Measurement of radionuclides in waste packages [DE85-011674] N85-33766

SOLIDIFICATION
Polyethylene solidification of low-level wastes [DE85-012568] N85-33799

SOLIDS
X-ray spectroscopy of solids under pressure [DE85-011486] N85-33213
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen [DE85-013256] N85-33445
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids [DE85-011456] N85-33714

SOLVENTS
Soil extraction kit [AD-D011736] N85-33190
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery [AD-D011738] N85-33575
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review [DE85-012537] N85-33635

SONAR
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884

SOUND WAVES
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431

SPACE DEBRIS
Procedure for estimating orbital debris risks [NASA-TP-2507] N85-33169

SPACE ENVIRONMENT SIMULATION
The use of perfluoroether lubricants in unprotected space environments N85-33523
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories [AERE-G-3368-PT-3] N85-33833

SPACE EXPLORATION
Far travelers: The exploring machines [NASA-SP-480] N85-33126

SPACE FLIGHT STRESS
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man [NASA-TM-58268] N85-33693

SPACE HEATING (BUILDINGS)
Pagosa Springs geothermal project [DE85-011308] N85-33583

SPACE MAINTENANCE
Telepresence work system concepts N85-33525
A strategy planner for NASA robotics applications [NASA-CR-175319] N85-33738

SPACE MANUFACTURING
Prospective uses for diffusion welding in vacuum N85-33145
Space station automation study. Automation requirements derived from space manufacturing concepts. Volume 1: Executive summary [NASA-CR-176099] N85-33170
Space Station automation study. Automation requirements derived from space manufacturing concepts. Volume 2: Technical report [NASA-CR-176100] N85-33171

SPACE PLASMAS
Surface voltage gradient role in high voltage solar array-plasma interaction: Center Director's discretionary fund [NASA-TM-86516] N85-33567

SPACE POWER REACTORS
Development of improved thermoelectric materials for space nuclear power systems [DE85-013079] N85-33607

SPACE SHUTTLE PAYLOADS
Appendange deployment mechanism for the Hubble Space Telescope program N85-33533

SPACE SHUTTLES
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man [NASA-TM-58268] N85-33693

SPACE STATIONS
A survey of structural material issues for a space station [NASA-TM-86385] N85-33168
Space station automation study. Automation requirements derived from space manufacturing concepts. Volume 1: Executive summary [NASA-CR-176099] N85-33170
Space Station automation study. Automation requirements derived from space manufacturing concepts. Volume 2: Technical report [NASA-CR-176100] N85-33171
Space station automation and robotics study. Operator-systems interface [NASA-CR-176095] N85-33172
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations [NASA-TM-87496] N85-33173

Statement of Aaron Cohen, Director, Research and Engineering, Johnson Space Center and Chairman, Space Station Advanced Technology Advisory Committee, National Aeronautics and Space Administration, before the Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, United States Senate
[NASA-TM-87497] N85-33174
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
Deployable-erectable trade study for space station truss structures
[NASA-TM-87573] N85-33181
The space station polar platform: NOAA systems considerations and requirements
[NOAA-TR-NESDIS-22] N85-33182
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539

SPACE TOOLS
Special tools used by cosmonauts in EVA N85-33129

SPACE-TIME FUNCTIONS
Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429

SPACEBORNE ASTRONOMY
Comments on RS-17 X-ray telescope N85-33132
Results from Astron orbiting telescope N85-33134
Mosaic Infrared Sensor for Space Astronomy (MIRSSA)
[NASA-CR-176154] N85-33456

SPACEBORNE EXPERIMENTS
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Results and prospects of physiological research during spaceflights N85-33139
Effect of substrate moisture on growth and structure of corn leaf N85-33692

SPACEBORNE PHOTOGRAPHY
Terrain illumination conditions when taking scanning photographs from space N85-33159
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
Mapping of dynamics of deltas by space photography N85-33163
Comprehensive mapping of arid territories of Arizona using space photography N85-33164

SPACEBORNE TELESCOPES
Astron telescope stabilization system N85-33133
Results from Astron orbiting telescope N85-33134
Astron X-ray experiment N85-33137

SPACECRAFT
Fuel cell applications literature review
[DE85-011891] N85-33592

SPACECRAFT CHARGING
Surface voltage gradient role in high voltage solar array-plasma interaction: Center Director's discretionary fund
[NASA-TM-86516] N85-33567

SPACECRAFT COMMUNICATION
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements
[AD-A155355] N85-33281
Satellite links in the ISO architecture: Models and performance evaluation
[ENST-84E017] N85-33284
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327
On the principle of uniformity of satellite communications systems N85-33382

SPACECRAFT CONFIGURATIONS
The space station polar platform: NOAA systems considerations and requirements
[NOAA-TR-NESDIS-22] N85-33182
Advanced beamed-energy and field propulsion concepts
[NASA-CR-176106] N85-33186

SPACECRAFT CONSTRUCTION MATERIALS
A survey of structural material issues for a space station
[NASA-TM-86385] N85-33168

SPACECRAFT CONTROL
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180

SPACECRAFT DESIGN
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180
Study and realization of a command system adapted to space robotics
[SNIAS-851-440-106] N85-33183
Evaluation study of mechanical refrigeration systems for application to space missions — infrared astronomy
[SNIAS-1029ACA/LL/V] N85-33277

SPACECRAFT DOCKING
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516

SPACECRAFT ENVIRONMENTS
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142

SPACECRAFT LAUNCHING
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528

SPACECRAFT MAINTENANCE
A modular docking mechanism for in-orbit assembly and spacecraft servicing N85-33516

SPACECRAFT MANEUVERS
Study and realization of a command system adapted to space robotics
[SNIAS-851-440-106] N85-33183

SPACECRAFT STRUCTURES
Effects of environment on spacecraft materials N85-33144
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180

SPACECRAFT TELEVISION
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Vatra telvision complex for Salyut orbital space station N85-33321

SPACECREWS
Psychophysiological distinctions of organization and regulation of daily cyclograms of crew activities during long-term spacecraft N85-33669
Results of microbiological studies conducted during operation of Salyut-6 orbital station N85-33682

SPACELAB
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man
[NASA-TM-58268] N85-33693

SPALLATION
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770

SPARK IGNITION
Experimental study of engine knock
[DE85-009851] N85-33268
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine
[DE85-009850] N85-33502

SPATIAL DISTRIBUTION
Interrelationships among the terrestrial planets N85-33859
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
SMM detection of interstellar Al-26 gamma radiation
[OG-3.2-1] N85-34001

SPATIAL RESOLUTION
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779

SPECIFICATIONS
Portable database driven control system for SPEAR
[DE85-010465] N85-33720

SPECTRA
Device for frequency modulation of a laser output spectrum
[DE85-011634] N85-33479
The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007

SPECTRAL BANDS
Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767

SPECTRAL EMISSION
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157

SPECTRAL REFLECTANCE
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156

SPECTRAL SIGNATURES
Physico-geographical regionalization of Caspian lowland based on space survey materials N85-33162

SPECTROGRAMS
Spacecraft-aided research discussed at geology Congress N85-33147

SPECTROMETERS
Program for observations of Halley's comet N85-33138
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c
[OG-4.1-1] N85-34007
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer
[OG-4.2-4] N85-34024
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101

SPECTROSCOPY
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155
Supercritical fluid chromatography/supersonic jet spectroscopy
[DE85-007005] N85-33221
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range
[OG-2.2-10] N85-33936

SPECTRUM ANALYSIS
Transmitter spectrum analyzer N85-33389
Binary signal detection in acoustooptic receivers N85-33430
Acetonitrile in the Earth's atmosphere: An upper limit deduced from infrared solar spectra
[AERONOMICA-ACTA-A-295-1985] N85-33623
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106

SPEECH RECOGNITION
Speech analysis system for assessing pilots' working fitness N85-33661

SPEED INDICATORS
Digital tachometer N85-33416

SPENT FUELS
Office of Civilian Radioactive Waste Management
[DE85-012585] N85-33774

SPERMATOGENESIS
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686

SPHERES
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223

SPHERICAL COORDINATES
Evaluation of coordinate measuring machines
[DE85-011712] N85-33467

SPHERICAL SHELLS
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field
[NASA-TM-87581] N85-33436

SPHEROMAKS
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research
[DE85-011463] N85-33821

SPINEL
Integrated current collector and catalyst support
[DE85-011616] N85-33311

SPIRAL GALAXIES
The galactic gamma-ray distribution and the radial cosmic ray gradient
[OG-3.1-4] N85-33992
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103

SPUTTERING
Advances in sputtered and ion plated solid film lubrication N85-33524
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826

SQUEEZE FILMS
Dual clearance squeeze film damper
[NASA-CASE-LEW-13506-1] N85-33490

STABILITY
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442

Tectonic stability and expected ground motion at Yucca Mountain
[DE85-012004] N85-33629
Saturation of a longitudinal instability due to nonlinearity of the wake field
[DE85-012514] N85-33761

STABILIZATION
Astron telescope stabilization system N85-33133
Amplitude stabilization of pulse signals N85-33320
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374

STABILIZERS (FLUID DYNAMICS)
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118

STAGE SEPARATION
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528

STAINLESS STEELS
Thermodynamic properties of alloys in the Fe-Ti system
[NPL-DMA(A)-96] N85-33229
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
Tritium-helium effects in metals
[DE85-011507] N85-33235

STANDARDIZATION
Standard series of direct-current motors for regulated electric drives N85-33375

STANDARDS
Digital matched filter N85-33339
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Development of solid thorium-232 reference materials
[DE85-011453] N85-33785

STARS
Neutrino-antineutrino annihilation around collapsing star
[OG-1.1-10] N85-33911
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920
Muon content of gamma ray induced EAS from Cygnus X-3
[OG-2.1-4] N85-33921
Gamma rays of energy or = 10(15) eV from Cyg X-3
[OG-2.1-5] N85-33922

STATIC CHARACTERISTICS
Method of static measurements of absolute scattering matrix of radar targets N85-33316

STATIC PRESSURE
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Explosive containment study
[DE85-011719] N85-33267

STATISTICAL ANALYSIS
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Logical and physical modeling and design of scientific and statistical databases for energy research
[DE85-006081] N85-33737
Statistical analyses in the study of solar wind-magnetosphere coupling
[DE85-009596] N85-33898
Observations of the Crab Nebula at energies 4.10(11)
[OG-2.3-1] N85-33938

STATISTICAL CORRELATION
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33396

STATISTICAL DISTRIBUTIONS
Phonetic transcription statistics: Constitution and statistical utilization
[ENST-85D001] N85-33285
Search for bursts in air shower data
[OG-5.3-10] N85-34076

STATORS
Induction motors with minimum waste of magnetic iron N85-33377
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378

STEADY STATE
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770

STEELS
Rapid analysis of steels using laser-based techniques
[DE85-010747] N85-33232
Management of Corrosion
[AGARD-LS-141] N85-33238
Corrosion management strategies for aircraft and related systems N85-33239
Induction motors with minimum waste of magnetic iron N85-33377

STEEPEST DESCENT METHOD
Some plant location problems --- computer networks
[FUB-14-1984] N85-33746

STEERING
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783

STELLAR ATMOSPHERES
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924

STELLAR ENVELOPES
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108

STELLAR GRAVITATION
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984

STELLAR MAGNETIC FIELDS
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923

STELLAR MASS
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996

STELLAR RADIATION
Microburst of TeV gamma rays from the Crab pulsar
[OG-2.3-4] N85-33941
Secondary periodicities of microbursts of TeV gamma rays from the Crab pulsar
[OG-2.3-5] N85-33942
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1
[MPE-191] N85-34112

STELLAR SPECTRA
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1
[MPE-191] N85-34112

STELLAR WINDS
Excess gamma-rays in the direction of the rho Ophiuchi cloud: An exotic object?
[OG-2.5-1] N85-33958
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102

STELLARATORS
Method and apparatus for maintaining equilibrium in a helical axis stellarator
[DE85-011626] N85-33815

STIFFNESS
Application of traction drives as servo mechanisms N85-33520
The properties of thin-section, four-point-contact ball bearings in space N85-33521

STOCHASTIC PROCESSES
Relating corrosion maintenance to environmental factors N85-33247
Stochastic groundwater flow modeling using the second-order method
[DE85-011250] N85-33556
Modeling and measurement of fault-tolerant multiprocessors
[NASA-CR-3920] N85-33732

STORAGE BATTERIES
Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575

STORAGE RINGS (PARTICLE ACCELERATORS)
Saturation of a longitudinal instability due to nonlinearity of the wake field
[DE85-012514] N85-33761

STRAIN HARDENING
Slideline verification for multilayer pressure vessels and piping analysis including strain hardening
[DE85-005816] N85-33549

STRATIGRAPHY
Lithology and stratigraphy of drill holes completed during 1984 in LANL use areas of Yucca Flat, Nevada Test Site, volume 6
[DE85-010695] N85-33831
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634

STRATOSPHERE
Ozone during sudden stratospheric warming: A three-dimensional simulation
[AERONOMICA-ACTA-A-292-1984] N85-33621
Voigt line profile computation of infrared lines in the stratosphere and mesosphere
[AERONOMICA-ACTA-A-294-1985] N85-33622

STRESS (PHYSIOLOGY)
Regulation of physical activity in antiorthostatic position by acting on adrenosympathetic and hypophyseo-adrenocortical systems N85-33689
Thermal stress suffered by tank crews working in summer heat
[DRIC-T-7492] N85-33698

STRESS (PSYCHOLOGY)
Operator's functional comfort zone when controlling moving object N85-33570
Regulation of physical activity in antiorthostatic position by acting on adrenosympathetic and hypophyseo-adrenocortical systems N85-33689

STRESS ANALYSIS
Remote temperature-set-point controller
[DE85-011614] N85-33459
Shear wave transducer for boreholes
[DE85-011662] N85-33461

STRESS CONCENTRATION
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
The stress distribution in pin-loaded orthotropic plates
[NASA-CR-176146] N85-33547

STRESS CORROSION
Automatic capability to store and retrieve component data and to calculate structural integrity of these components
[DE85-012429] N85-33728

STRESS CORROSION CRACKING
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244
Relating corrosion maintenance to environmental factors N85-33247

STRESS-STRAIN RELATIONSHIPS
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Remote temperature-set-point controller
[DE85-011614] N85-33459

STRESSES
Temperature sensitivity of fiber-optic transmission line N85-33331
Slideline verification for multilayer pressure vessels and piping analysis including strain hardening
[DE85-005816] N85-33549

STRIATION
Striation free doped silicon
[AD-A155730] N85-33827

STRIP TRANSMISSION LINES
Application of field similitude theory to calculation of stripline heating N85-33419

STROBOSCOPES
Characteristics of digital range finder with stroboscopic discretization N85-33319

STRONTIUM 90
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1983
[CISE-2515] N85-33617

STRUCTURAL ANALYSIS
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714

STRUCTURAL DESIGN
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539

STRUCTURAL DESIGN CRITERIA
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747

STRUCTURAL FAILURE
Automatic capability to store and retrieve component data and to calculate structural integrity of these components
[DE85-012429] N85-33728

STRUCTURAL PROPERTIES (GEOLOGY)
Compressional environment in the location and orientation of planetary dorsa and terrestrial earthquake fault structures N85-33885

STRUCTURAL RELIABILITY
Reactor pressure vessel steels ASME SA533B and SA508 C 1.2
[VTT-340] N85-33507
STRUCTURAL VIBRATION
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
SUBASSEMBLIES
Multistage spent particle collector and a method for making same
[NASA-CASE-LEW-13914-1] N85-33489
SUBSTRATES
Rationale in the selection of corrosion protective coating systems N85-33242
Thermoelectric generator and method for the fabrication thereof
[DE85-011650] N85-33302
Electron beam enhanced surface modification for making highly resolved structures
[DE85-011609] N85-33305
Effect of substrate moisture on growth and structure of corn leaf N85-33692
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826
SUBSTRUCTURES
A substructure coupling procedure applicable to general linear time-invariant dynamic systems
[NASA-CR-176144] N85-33542
SULFATES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
Effects of H2S on molten carbonate fuel cells. Literature review on the impact of SO2 in the oxidant supplied to molten carbonate fuel cells
[DE85-011698] N85-33586
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
SULFIDES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
SULFUR
A new analysis of cosmic ray isotopes at 3 GeV/n from HEAO3-C2 data
[OG-4.3-6] N85-34031
SULFUR DIOXIDES
Effects of H2S on molten carbonate fuel cells. Literature review on the impact of SO2 in the oxidant supplied to molten carbonate fuel cells
[DE85-011698] N85-33586
The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611
SULFUR OXIDES
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
SULFURIC ACID
Synthesis of 2,4,8,10-tetroxaspiro5,5undecane
[NASA-CASE-ARC-11243-2] N85-33187
SUN
Terrain illumination conditions when taking scanning photographs from space N85-33159
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field
[OG-5.1-9] N85-34051
SUPERCONDUCTING MAGNETS
Design improvements and cost reductions for a 5000 MWh superconducting Magnetic Energy Storage plant
[DE85-010572] N85-33830
SUPERCONDUCTIVITY
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33308
SUPERCONDUCTORS
Cryogenic system for the University of Washington Superconducting Booster
[DE85-010604] N85-33274
Magnetic shielding with superconductors based on niobium-tin compounds N85-33370
SUPERCRITICAL FLUIDS
Supercritical fluid chromatography/supersonic jet spectroscopy
[DE85-007005] N85-33221
SUPERNOVA REMNANTS
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109
SUPERNOVAE
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
Diffuse galactic annihilation radiation from supernova nucleosynthesis
[OG-3.2-8] N85-34004
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108
SUPINE POSITION
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
SUPPORTS
Properties of Ti-6Al-4V spun formed fuze supports
[DE85-011968] N85-33498
SURFACE FINISHING
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265
SURFACE LAYERS
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
SURFACE WATER
Global environmental transport models for tritium
[DE85-011437] N85-33639
SURFACE WAVES
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431
Numerical experiment of elastic wave propagation by framework model
[DRIC-T-7462] N85-33511
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753
SURFACES
Removable cleanable antireflection shield
[AD-D011735] N85-33810
SURVEILLANCE
Power density and threshold control strategies for radar track initiation
[AD-A155357] N85-33282
SWEPT WINGS
Selecting step sizes in sensitivity analysis by finite differences
[NASA-TM-86382] N85-33538
SWITCHES
Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483
SWITCHING
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
SWITCHING CIRCUITS
Switching power supply
[DE85-005993] N85-33312
Capacitance measuring device
[DE85-011643] N85-33460
SYMMETRICAL BODIES
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
SYMPATHETIC NERVOUS SYSTEM
Regulation of physical activity in antiorthostatic position by acting on adrenosympathetic and hypophyseo-adrenocortical systems N85-33689
SYNCHRONOUS PLATFORMS
The space station polar platform: NOAA systems considerations and requirements
[NOAA-TR-NESDIS-22] N85-33182
SYNCHRONOUS SATELLITES
International prototype network in Dubna experimental satellite communications system N85-33383
SYNCHROTRON RADIATION
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755
Saturation of a longitudinal instability due to nonlinearity of the wake field
[DE85-012514] N85-33761
On the emission region of gamma ray bursts
[OG-1.1-4] N85-33906
The electron spectra in the synchrotron nebula of the supernova remnant G 29.7-0.3
[OG-6.2-10] N85-34109
SYNCHROTRONS
Heavy ion medical accelerator options
[DE85-011204] N85-33784
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788
SYNTAX
Research on distributed artificial intelligence
[AD-A155356] N85-33733
SYNTHESIS (CHEMISTRY)
Synthesis of 2,4,8,10-tetroxaspiro5,5undecane
[NASA-CASE-ARC-11243-2] N85-33187
SYNTHETIC APERTURE RADAR
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time N85-33384
SYNTHETIC FUELS
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192
SYSTEM FAILURES
Failure testing of active solar energy system components
[DE84-013024] N85-33561
SYSTEM IDENTIFICATION
Multishaker modal testing
[NASA-CR-176139] N85-33544
SYSTEMS ANALYSIS
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
SYSTEMS ENGINEERING
System for computer-aided design of analog electronic circuits N85-33353
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710
Portable database driven control system for SPEAR
[DE85-010465] N85-33720
Flat is not necessarily good
[DE85-012819] N85-33723
SYSTEMS INTEGRATION
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119
Digital matched filter N85-33339
SYSTEMS MANAGEMENT
User commands for product design and system management
[DE85-011708] N85-33721
SYSTEMS SIMULATION
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699

T

TABLES (DATA)
Phonetic transcription statistics: Constitution and statistical utilization
[ENST-85D001] N85-33265
TACHOMETERS
Digital tachometer N85-33416
TACTICS
Transceiver test device
[AD-D011728] N85-33458
TANKS (COMBAT VEHICLES)
Thermal stress suffered by tank crews working in summer heat
[DRIC-T-7492] N85-33698
TAPE RECORDERS
Module for interfacing microprocessors and microcomputer N85-33390
TARGET ACQUISITION
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699
TARGET RECOGNITION
Selectivity of weight compensator of passive interference to unknown velocities of detectable targets N85-33317

TATB
Sensitivity and performance characterization of DINGU [DE85-010750] N85-33269
TECHNOLOGICAL FORECASTING
Structure and functions of ultra-thin films of organic compounds [DRIC-T-7481] N85-33188
TECHNOLOGY ASSESSMENT
Advanced beamed-energy and field propulsion concepts [NASA-CR-176108] N85-33186
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting [AD-A155383] N85-33553
Low-head hydroelectric power demonstration project: City of Gonzales, Texas [DE85-010403] N85-33595
Photovoltaic industry progress through 1984 [DE85-013029] N85-33596
TECHNOLOGY TRANSFER
Photovoltaics technical information guide [DE85-002924] N85-33585
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel [DE85-013316] N85-33598
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843
TECHNOLOGY UTILIZATION
Statement of Aaron Cohen, Director, Research and Engineering, Johnson Space Center and Chairman, Space Station Advanced Technology Advisory Committee, National Aeronautics and Space Administration, before the Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, United States Senate [NASA-TM-87497] N85-33174
TECTONICS
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phlogopite and apatite deposits N85-33153
Crustal Dynamics Project: Catalogue of site information [NASA-TM-86218] N85-33552
Tectonic stability and expected ground motion at Yucca Mountain [DE85-012004] N85-33629
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction [DE85-011794] N85-33632
Impact processes and their implications for planetary formation and early evolution N85-33860
Planetary surface processes: A review N85-33869
A solid-state framework for terrestrial upper mantles N85-33878
Crustal development in the terrestrial planets N85-33879
Contrasts in evolution of Venus and Earth N85-33880
Compressional environment in the location and orientation of planetary dorsa and terrestrial earthquake fault structures N85-33885
TELECOMMUNICATION
A model for predicting propagation-related DSCS (Defense Communications Engineering Center) margin requirements [AD-A155355] N85-33261
USSR report: Electronics and electrical engineering [JPRS-UEE-84-003] N85-33381
TELEMETRY
Telemetry system for the transmission of data from projectiles during the acceleration phase in the gun barrel [ISL-CO-207/84] N85-33178
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility [PB85-185817] N85-33648
TELEOPERATORS
Space station automation and robotics study. Operator-systems interface [NASA-CR-176095] N85-33172
Space station automation study: Autonomous systems and assembly, volume 2 [NASA-CR-176092] N85-33175
Telepresence work system concepts N85-33525
Dual arm master controller development N85-33526
TELESCOPES
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope [OG-4.1-5] N85-34011
TELEVISION CAMERAS
LI481 and LI482 vidicons for two-tube color TV cameras with improved image quality N85-33333
TEMPERATURE COMPENSATION
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft [NASA-TM-86732] N85-33121
TEMPERATURE CONTROL
Remote temperature-set-point controller [DE85-011614] N85-33459
Electronic temperature equalizer [PB85-181485] N85-33475
TEMPERATURE DISTRIBUTION
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
TEMPERATURE EFFECTS
Temperature sensitivity of fiber-optic transmission line N85-33331
Thermal stress suffered by tank crews working in summer heat [DRIC-T-7492] N85-33698
Design analysis for a repository in crystalline rock [DE85-011802] N85-33771
TEMPERATURE GRADIENTS
Electronic temperature equalizer [PB85-181485] N85-33475
TEMPERATURE MEASUREMENT
Application of field similitude theory to calculation of stripline heating N85-33419
IEA-SSPS CRS calibration report: Calibration of relevant measuring sensors [DE85-010174] N85-33468
Electronic temperature equalizer [PB85-181485] N85-33475
TEMPERATURE PROFILES
Application of nonlinear least squares methods to the analysis of solar spectra [NASA-CR-176122] N85-33637
TEMPERATURE SENSORS
On-line temperature sensor [DE85-011641] N85-33465
TENSILE STRENGTH
Long-term strength of glass fibre/phenolic resin composites [NPL-DMA(A)-98] N85-33195
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers [RR-R84-4] N85-33196
TENSORS
Interacting Boson approximation [DE85-003016] N85-33756
TERMINAL BALLISTICS
Numerical simulation of interior and terminal ballistics phenomena. Investigation of the effects of the parameters and application examples [ISL-R-112/84] N85-33731
Presentation of numerical simulation work in terminal ballistics using a few examples. Applications of the calculation model Program for Elastoplastic Simulation of Impacts (PEPSI) of the Franco-German Research Institute Saint Louis (ISL) [ISL-CO-209/84] N85-33741
TERRAIN
Implementation of the SITAN algorithm in the digital terrain management and display system [DE85-010659] N85-33115
Terrain illumination conditions when taking scanning photographs from space N85-33159
MELSAR: A mesoscale air quality model for complex terrain. Volume 1: Overview, technical description and user's guide [DE85-010943] N85-33608
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers [DE85-012960] N85-33613
TERRAIN ANALYSIS
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884
TERRESTRIAL PLANETS
Terrestrial Planets: Comparative Planetology [NASA-CR-176093] N85-33849
Noble gases in meteorites and terrestrial planets N85-33850
Terrestrial Xe isotopic contraints on the early history of the Earth N85-33852
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854
The distribution of compositional classes in the asteroid belt: A cosmochemical fingerprint? N85-33856
Late-stage planetesimals: How big? N85-33857
What determines the location of satellites and planets? N85-33858
Interrelationships among the terrestrial planets N85-33859
Impact processes and their implications for planetary formation and early evolution N85-33860
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863
A solid-state framework for terrestrial upper mantles N85-33878
Crustal development in the terrestrial planets N85-33879
Magnetic field generation in the cores of terrestrial bodies N85-33894
TEST CHAMBERS
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model [PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development [PB85-186492] N85-33619
TEST EQUIPMENT
Electromagnetic inspection of wire ropes using sensor arrays [AD-A155412] N85-33509
TEST FACILITIES
Low temperature experimental capability for use with gas guns [DE85-010418] N85-33548
TEST FIRING
Use of the computer programa PARA 80 to study results from firing the railgun ERGS-1M [MRL-R-900] N85-33167
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada [DE85-011145] N85-33612
TEST RANGES
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada [DE85-011145] N85-33612
THEMATIC MAPPING
Comprehensive mapping of arid territories of Arizona using space photography N85-33164
THERMAL ABSORPTION
Heat-mass flow enhancement system for a metal hydride assembly [DE85-010698] N85-33441
THERMAL CONDUCTIVITY
The design, construction and operation of a large-area, high-temperature, thermal conductance apparatus --- furnace insulation [NPL-DMA(A)-84] N85-33455
The properties of thin-section, four-point-contact ball bearings in space N85-33521
Development of improved thermoelectric materials for space nuclear power systems [DE85-013079] N85-33807
THERMAL ENERGY
Design and development of a linear thermal actuator N85-33518
Study of alternative system conversions for the Solar One pilot plant [DE85-010026] N85-33594
THERMAL ENVIRONMENTS
Filament wound structures in PSP carbon composite [RV10/84424] N85-33198
THERMAL EXPANSION
Temperature sensitivity of fiber-optic transmission line N85-33331
Design and development of a linear thermal actuator N85-33518
THERMAL INSULATION
The design, construction and operation of a large-area, high-temperature, thermal conductance apparatus --- furnace insulation [NPL-DMA(A)-84] N85-33455
THERMAL NEUTRONS
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission [DE85-011659] N85-33454
THERMAL RADIATION
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
THERMAL STABILITY
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related) [DE85-012339] N85-33263
THERMAL STRESSES
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments [DE85-011868] N85-33233
THERMOCHEMISTRY
Process for improving the quality of epitaxial silicon films grown on insulating substrates [AD-D011730] N85-33828

THERMOCOUPLES
IEA-SSPS CRS calibration report: Calibration of relevant measuring sensors
[DE85-010174] N85-33468
THERMODYNAMIC CYCLES
Adiabatic thermal models for planetary bodies N85-33881
THERMODYNAMIC EFFICIENCY
Fuel cell applications literature review
[DE85-011891] N85-33582
THERMODYNAMIC PROPERTIES
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4
[DE85-012966] N85-33831
THERMOELASTICITY
A review of path-independent integrals in elastic-plastic fracture mechanics, task 4
[NASA-CR-174956] N85-33541
THERMOELECTRIC GENERATORS
Thermoelectric generator and method for the fabrication thereof
[DE85-011650] N85-33302
THERMOELECTRIC MATERIALS
Development of improved thermoelectric materials for space nuclear power systems
[DE85-013079] N85-33807
THERMOLUMINESCENCE
Error evaluation in measurements with thermoluminescent dosimeters
[ISS-T-84/6] N85-33471
THERMOREGULATION
Microwave radiation and thermoregulation
[AD-A155718] N85-33654
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687
THERMOSTATS
TEMO and TEB thermoelectronic devices N85-33415
THIN FILMS
Structure and functions of ultra-thin films of organic compounds
[DRIC-T-7481] N85-33188
Examination of anisotropic films by resonance method N85-33412
Advances in sputtered and ion plated solid film lubrication N85-33524
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
THORIUM ISOTOPES
Development of solid thorium-232 reference materials
[DE85-011453] N85-33785
THREADS
The design and development of a spacecraft appendage tie down mechanism N85-33522
THREE DIMENSIONAL MOTION
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474
THRUST
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
THRUST AUGMENTATION
Discussion of the paper, Some Aspects of Propulsion for the Augmenter-Wing Concept, by D. C. Whittley
[NASA-TM-77884] N85-33108
THRUST MEASUREMENT
Two-plane balance and slip-ring design N85-33536
THYRISTORS
Standard series of direct-current motors for regulated electric drives N85-33375
Photothyristor optrons and optron microcircuits, part 1 N85-33424
THYROID GLAND
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666
TIDES
On the importance of viscous dissipation in Io N85-33873
TIME
Digital matched filter N85-33339
Dual optical mechanical position tracker
[AD-D011739] N85-33811
An internally consistent gamma ray burst time history phenomenology
[OG-1.2-6] N85-33916
TIME DEPENDENCE
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
Analysis of solution of Bloch's equations in time domain N85-33371
Model projections of time-dependent response to increasing carbon dioxide
[DE85-013326] N85-33641
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness
[OEFZS-4312] N85-33762
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV
[OG-2.1-11] N85-33927
TIME FUNCTIONS
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
TIME MEASUREMENT
Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
Observations of the Crab Nebula at energies 4.10(11)
[OG-2.3-1] N85-33938
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
TIME OF FLIGHT SPECTROMETERS
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry
[ISL-R-109/84] N85-33226
TIME RESPONSE
Generalization of discrete Fourier transform for interpolation in time domain N85-33396
Generalization of discrete Fourier transformation for interpolation in time domain N85-33400
TIN ALLOYS
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33308
TITANIUM
Properties of Ti-6Al-4V spun formed fuze supports
[DE85-011968] N85-33498
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels
[NASA-TP-2480] N85-33537
TITANIUM ALLOYS
Thermodynamic properties of alloys in the Fe-Ti system
[NPL-DMA(A)-96] N85-33229
TOKAMAK DEVICES
System and method of operating toroidal magnetic confinement devices
[DE85-011670] N85-33814
TOLERANCES (PHYSIOLOGY)
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694
TOLUENE
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655
TOMOGRAPHY
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779
TOPOGRAPHY
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
Planetary surface processes: A review N85-33869
TOPOLOGY
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
TOROIDAL PLASMAS
System and method of operating toroidal magnetic confinement devices
[DE85-011670] N85-33814
TOROIDS
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research
[DE85-011463] N85-33821
TORQUE
Drag-compensated, precision-powered hinge system N85-33517
Application of traction drives as servo mechanisms N85-33520
The properties of thin-section, four-point-contact ball bearings in space N85-33521
Two-plane balance and slip-ring design N85-33536
TORQUEMETERS
Two-plane balance and slip-ring design N85-33536
TORSION
Application of traction drives as servo mechanisms N85-33520
TOXIC HAZARDS
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696
TOXICITY
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694
TRACKING (POSITION)
Department of Energy gear drive unit final prototype testing and design evaluation
[DE85-003296] N85-33499
Airborne cloud tracking measurements during the Three Mile Island nuclear station accident, Middletown, Pennsylvania. Date of survey: March - June 1979
[DE85-012060] N85-33638
Operator's functional comfort zone when controlling moving object N85-33670
Effects of low level carbon monoxide (CO) on tracking and monitoring. An attempt to replicate the findings of Putz et al. (1976) protocol 2
[AD-A155722] N85-33694
TRACKING FILTERS
Synthesis of adaptive filters for tracking radio systems N85-33325
TRACTION
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491
Application of traction drives as servo mechanisms N85-33520
TRADESCANTIA
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
TRAILING EDGES
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109
TRAJECTORY CONTROL
A method of accurizing rail guns
[LA-10028-MS] N85-33166
TRANSDUCERS
Shear wave transducer for boreholes
[DE85-011662] N85-33461
Device for frequency modulation of a laser output spectrum
[DE85-011634] N85-33479
Non-bonded ultrasonic transducer
[DE85-011006] N85-33504
Electromagnetic inspection of wire ropes using sensor arrays
[AD-A155412] N85-33509
TRANSFER FUNCTIONS
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
TRANSFORMERS
Calculation of external magnetic field of a shielded transformer N85-33373
TRANSIENT RESPONSE
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543
TRANSISTOR AMPLIFIERS
KT3127A, KT3128A transistors N85-33414
TRANSISTOR CIRCUITS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-015] N85-33314
Noise in stages and in interstage couplings of various transistor circuits N85-33334
TRANSITION FLOW
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121

TRANSITION POINTS
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225
TRANSITION PROBABILITIES
Probabilistic analysis of automatic control systems for detection systems N85-33335
Vacuum ultraviolet laser
[DE85-011632] N85-33478
TRANSMISSION LINES
Temperature sensitivity of fiber-optic transmission line N85-33331
Maximally flat approximation of attenuation characteristics of coupled-line filters N85-33393
TRANSMITTER RECEIVERS
Transceiver test device
[AD-D011728] N85-33458
TRANSMITTERS
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Transmitter spectrum analyzer N85-33389
Microcomputer controlled image processor
[AD-D011734] N85-33735
TRANSONIC SPEED
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
TRANSPARENCE
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
TRANSPORT AIRCRAFT
Energy efficient transport technology: Program summary and bibliography
[NASA-RF-1135] N85-33116
Application of frequency domain handling qualities criteria to the longitudinal landing task
[NASA-TM-86728] N85-33124
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515
TRANSPORT PROPERTIES
Comments on two matters related to turbulent combustion N85-33204
New and revised methods of purifying mercuric iodide
[DE85-011684] N85-33237
Estimation of Sr90 and Cs137 activity introduced and accumulation in the Po basin until 1983
[CISE-2515] N85-33617
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632
Nuclear data for MCNP
[DE85-010794] N85-33782
TRANSPORT THEORY
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742
Collisional transport for a superthermal ion species in a plasma
[DE85-011943] N85-33818
TRANSURANIUM ELEMENTS
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission
[DE85-011659] N85-33454
TRITIUM
Tritium-helium effects in metals
[DE85-011507] N85-33235
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Global environmental transport models for tritium
[DE85-011437] N85-33639
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817
TRIVALENT IONS
Trivalent cerium doped crystals as tunable laser systems: Two bad apples
[DE85-008168] N85-33482
TRUSSES
Deployable-erectable trade study for space station truss structures
[NASA-TM-87573] N85-33181
Structural dynamics model and response of the deployable reference configuration space station
[NASA-TM-86386] N85-33539
TUMORS
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655
TUNABLE LASERS
Trivalent cerium doped crystals as tunable laser systems: Two bad apples
[DE85-008168] N85-33482
TUNING
Gradiental adaptive corrector with optimum tuning step N85-33403
TURBINE BLADES
Local heat-transfer measurements on a large, scale-model turbine blade airfoil using a composite of a heater element and liquid crystals
[NASA-TM-86900] N85-33435
TURBOJET ENGINE CONTROL
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527
TURBOPROP ENGINES
Two-plane balance and slip-ring design N85-33536
TURBULENCE
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine
[DE85-009850] N85-33502
A simulation of high energy cosmic ray propagation 1
[OG-5.4-1] N85-34078
TURBULENT BOUNDARY LAYER
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109
TURBULENT FLOW
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
Comments on two matters related to turbulent combustion N85-33204
Pressure correlations in turbulent reacting flows N85-33205
Second order modelling in non-constant density flows N85-33206
Turbulent mixing and combustion N85-33207
Jet flows: Modelling and experiments N85-33208
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Vortex dynamics simulation of conserved scalar dissipation N85-33210
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211
Modeling of turbulent recirculating combusting flows N85-33212
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
TURBULENT JETS
Jet flows: Modelling and experiments N85-33208
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
TURBULENT MIXING
Turbulent mixing and combustion N85-33207
Jet flows: Modelling and experiments N85-33208
TURBULENT WAKES
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450
TWO DIMENSIONAL FLOW
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442
Turbulence modelling for the prediction of turbulent jets: Wakes and plumes
[CFD/84/5] N85-33447
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
TWO PHASE FLOW
Enthalpy transients in fractured two-phase geothermal systems
[DE85-011988] N85-33587

U

U.S.S.R.
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
ULTRASONIC FLAW DETECTION
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F --- aircraft structures
[PV-43-954/F] N85-33510
ULTRASONIC WELDING
Ultrasonic seam welding on thin silicon solar cells
[NASA-CR-176116] N85-33570
ULTRASONICS
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
Non-bonded ultrasonic transducer
[DE85-011006] N85-33504
ULTRAVIOLET ABSORPTION
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
ULTRAVIOLET ASTRONOMY
Astron X-ray experiment N85-33137
ULTRAVIOLET LASERS
Vacuum ultraviolet laser
[DE85-011632] N85-33478
ULTRAVIOLET RADIATION
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
UNDERWATER ACOUSTICS
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
UNDERWATER TESTS
Predicting electrical performance parameters of underwater cables N85-33391
UNITED STATES
Magnetic Fusion Program plan
[DE85-009861] N85-33823
UNIVERSITIES
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843
UNMANNED SPACECRAFT
Far travelers: The exploring machines
[NASA-SP-480] N85-33126
UNSTEADY FLOW
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
UPPER ATMOSPHERE
Geologic processes on Venus: An update N85-33883
UPWELLING WATER
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
URANIUM
Reaction of uranium and the fluorocarbon FC-75
[DE85-012322] N85-33802
URANIUM ISOTOPES
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Gamma-ray line intensities for depleted uranium
[DE85-012674] N85-33804
URBAN RESEARCH
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640
URINE
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684
USER MANUALS (COMPUTER PROGRAMS)
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563
QKPLT users guide, version 2.0
[L-10094-M] N85-33707

CARE 3 MENU maintenance manual
[NASA-CR-172609] N85-33708
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724

USER REQUIREMENTS
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709

V

VACUUM
Prospective uses for diffusion welding in vacuum N85-33145

VACUUM DEPOSITION
Advances in sputtered and ion plated solid film lubrication N85-33524

VACUUM EFFECTS
Prospective uses for diffusion welding in vacuum N85-33145

VACUUM SYSTEMS
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
Supermite vacuum interface design
[DE85-012861] N85-33759
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817

VALUE ENGINEERING
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120

VALVES
Automatic rotary valve actuator
[DE85-012797] N85-33505

VANADIUM
Properties of Ti-6Al-4V spun formed fuze supports
[DE85-011968] N85-33498

VAPOR DEPOSITION
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
An impact-induced terrestrial atmosphere and iron-water reactions during accretion of the Earth N85-33864

VAPOR PHASES
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
Volatile loss following very large impacts N85-33862
Volatiles on satellites of the outer solar system N85-33868

VAPORS
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
New and revised methods of purifying mercuric iodide
[DE85-011684] N85-33237
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438

VARIABILITY
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV
[OG-2.1-11] N85-33927
A search in the COS-B data base for correlated time variability in regions containing objects of interest
[OG-2.5-9] N85-33964

VARIABLE STARS
Galactic gamma-ray sources, SNOBs, and giant H2 regions
[OG-2.5-4] N85-33961

VARIATIONS
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Gamma-ray burst variability above 4 MeV
[OG-1.2-7] N85-33917
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075

VARISTORS
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators
[DE85-010827] N85-33230

VAX-11/780 COMPUTER
Integrated Support Software System (ISSS)
[AD-A155715] N85-33710

VECTOR MESONS
Does low-energy physics depend on the potential of a heavy Higgs-particle
[NIKHEF-H/85-1] N85-33763

VEGETATION GROWTH
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156

VELOCITY
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
The design and development of a constant-speed solar array drive N85-33519

VELOCITY MEASUREMENT
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470

VENUS (PLANET)
Extended atmospheres of outer planet satellites and comets
[NASA-CR-176137] N85-33848
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
Contrasts in evolution of Venus and Earth N85-33880
Geologic processes on Venus: An update N85-33883
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888
Admittance functions from Venus vertical gravity and modes of topographic support N85-33889

VENUS ATMOSPHERE
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847

VENUS PROBES
Laboratory evaluation and application of microwave absorption properties under simulated conditions for planetary atmospheres
[NASA-CR-176078] N85-33847

VERTICAL DISTRIBUTION
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637

VERTICAL ORIENTATION
Admittance functions from Venus vertical gravity and modes of topographic support N85-33889

VERY HIGH FREQUENCIES
Radar wind profilers in the Colorado network
[PB85-185486] N85-33647

VERY LONG BASE INTERFEROMETRY
Crustal Dynamics Project: Catalogue of site information
[NASA-TM-86218] N85-33552

VESTIBULAR TESTS
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690

VESTIBULES
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690

VIBRATION
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747
Accelerator vibration issues
[DE85-010766] N85-33791
Dual optical mechanical position tracker
[AD-D011739] N85-33811

VIBRATION DAMPING
Fixed gain and adaptive techniques for rotorcraft vibration control
[NASA-CR-177344] N85-33111
Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
A substructure coupling procedure applicable to general linear time-invariant dynamic systems
[NASA-CR-176144] N85-33542
Multishaker modal testing
[NASA-CR-176139] N85-33544

VIDEO DISKS
Electronic file system on an SM 90 minicomputer: The SARDE project
[ENST-84E018] N85-33705

VIDEO SIGNALS
Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361

VIDICONS
LI481 and LI482 vidicons for two-tube color TV cameras with improved image quality N85-33333

VINYL POLYMERS
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703

VIRGO GALACTIC CLUSTER
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34085

VISCOELASTICITY
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437

VISCOSITY
Thermophysical properties of fluids for the gas industry
[PB85-198471] N85-33227
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888

VISCOUS FLOW
On the importance of viscous dissipation in Io N85-33873

VISION
The development and evaluation of color display systems for airborne applications. Phase 1: Fundamental visual, perceptual, and display system considerations
[FAA/PM-85-19] N85-33700

VISUAL DISCRIMINATION
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161

VISUAL PERCEPTION
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753

VITRIFICATION
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610

VOICE COMMUNICATION
Speech analysis system for assessing pilots' working fitness N85-33661

VOICE DATA PROCESSING
Introduction to adaptive techniques for voice signal processing
[FUB-52-1983] N85-33287

VOIGT EFFECT
Voigt line profile computation of infrared lines in the stratosphere and mesosphere
[AERONOMICA-ACTA-A-294-1985] N85-33622

VOLATILITY
Nebular volatile fractionations associated with chondrule formation N85-33855
Volatile loss following very large impacts N85-33862
Volatiles on satellites of the outer solar system N85-33868

VOLCANOLOGY
Planetary surface processes: A review N85-33869
Planning for VRM: Radar and sonar studies of volcanic terrains on Earth, Venus and Mars N85-33884

VOLTAGE REGULATORS
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300

VORTEX GENERATORS
Vortex generating flow passage design for increased film cooling effectiveness
[NASA-CASE-LEW-14039-1] N85-33433

VORTICES
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109
Vortex dynamics simulation of conserved scalar dissipation N85-33210
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563

VORTICITY EQUATIONS
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence --- kinetic energy-vorticity fluctuations (k-W)
[CFD/84/21] N85-33448
VOYAGER PROJECT
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
VOYAGER 1 SPACECRAFT
Analysis of Jovian decametric data: Study of radio emission mechanisms
[NASA-CR-176057] N85-33846

W

WAFERS
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
WARFARE
Transceiver test device
[AD-D011728] N85-33458
WARNING SYSTEMS
ARAC status report, 1985
[DE85-012835] N85-33603
WASTE DISPOSAL
Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765
Office of Civilian Radioactive Waste Management
[DE85-012585] N85-33774
WASTE ENERGY UTILIZATION
Woven heat exchanger
[DE85-011633] N85-33439
WASTE HEAT
Woven heat exchanger
[DE85-011633] N85-33439
WASTE TREATMENT
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659
WASTE WATER
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
WASTES
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635
WATER FLOW
Computer and water-model simulation of flow through poppet valves
[CFD/85/2] N85-33449
Military hydrology. Report 9: State-of-the-art review and annotated bibliography of dam-breach flood forecasting
[AD-A155383] N85-33553
Stochastic groundwater flow modeling using the second-order method
[DE85-011250] N85-33556
WATER LANDING
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982
[PB85-910406] N85-33114
WATER POLLUTION
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600
Acid rain in Europe
[COMMITTEE-PRINT-99-F] N85-33601
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Environmental summary for calendar year 1984
[DE85-012020] N85-33604
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
WATER QUALITY
Soil extraction kit
[AD-D011736] N85-33190
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
Legionnaires' disease bacteria in power plant cooling systems: Phase 2
[DE85-011546] N85-33695
WATER RECLAMATION
Experimental validation of allowable concentrations of sodium and potassium in recycled drinking water
N85-33685
WATER TREATMENT
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
Experimental validation of allowable concentrations of sodium and potassium in recycled drinking water
N85-33685
WATER TUNNEL TESTS
Circulation control lift generation experiment: Hardware development N85-33535
WATER VAPOR
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments
N85-33683
WATER WAVES
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time
N85-33384
WATERPROOFING
Land vehicle corrosion management N85-33246
WATTMETERS
The Mk.1 NPL digital sampling ac wattmeter
[NPL-DES-82] N85-33290
WAVE ATTENUATION
Maximally flat approximation of attenuation characteristics of coupled-line filters N85-33393
WAVE DIFFRACTION
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431
WAVE EQUATIONS
Generalized string amplitude and wave equation for hadrons
[DE85-011492] N85-33798
WAVE FRONTS
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
Heterodyne holographic interferometry for visualization of surface acoustic waves
[AD-A155405] N85-33753
WAVE PROPAGATION
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327
USSR report: Electronics and electrical engineering
[JPRS-UEE-84-003] N85-33381
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
Numerical experiment of elastic wave propagation by framework model
[DRIC-T-7462] N85-33511
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-60 GeV/n
[OG-4.1-6] N85-34012
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
Galactic propagation models consistent with the cosmic ray lifetime derived from Be-10 measurements
[OG-4.3-1] N85-34026
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027
A simulation of high energy cosmic ray propagation 1
[OG-5.4-1] N85-34078
WAVE SCATTERING
Characteristics of optical information-measurement channels with utilization of scattering effects
N85-33429
WAVEFORMS
Transceiver test device
[AD-D011728] N85-33458
WAVEGUIDE FILTERS
Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
WAVEGUIDES
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Miniature two-mode filters N85-33394
Strongly coupled millimeter-band waveguide directional couplers N85-33418
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420
WAVES
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Shear wave transducer for boreholes
[DE85-011682] N85-33461
WEAK INTERACTIONS (FIELD THEORY)
Does low-energy physics depend on the potential of a heavy Higgs-particle
[NIKHEF-H/85-1] N85-33783
WEAR
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491
Application of traction drives as servo mechanisms
N85-33520
WEATHER FORECASTING
Monthly and seasonal weather outlook for April 1985, March 30, 1985, volume 39, no. 7
[PB85-183804] N85-33646
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloquium
[PB85-188266] N85-33649
WEBS (SHEETS)
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
WEIGHTING FUNCTIONS
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742
WEIGHTLESSNESS
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Mechanisms of osteodystrophy in weightlessness
N85-33143
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Labyrinthine and extralabyrinthine mechanisms of development of motion sickness in weightlessness
N85-33668
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite
N85-33679
Morphological study of antiorthostatic hypokinesia in monkeys N85-33680
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688
Effect of substrate moisture on growth and structure of corn leaf N85-33692
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man
[NASA-TM-58268] N85-33693
WELD STRENGTH
Diffusion welding of Cassegrainian concentrator cell stack assemblies
[NASA-CR-176104] N85-33566
Ultrasonic seam welding on thin silicon solar cells
[NASA-CR-176116] N85-33570
WELD TESTS
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551
WELDABILITY
Ultrasonic seam welding on thin silicon solar cells
[NASA-CR-176116] N85-33570

WELDED JOINTS
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551
WELLS
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
Proposed resource evaluation plan. Salton Sea scientific drilling program
[DE85-011294] N85-33633
WHEAT
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156
WHITE DWARF STARS
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
WHITE NOISE
Noise in stages and in interstage couplings of various transistor circuits N85-33334
Nonlinear filtration of clutter N85-33404
WIDE ANGLE LENSES
Evidence for long-term variability in the ultra high energy photon flux from Cygnus X-3
[OG-2.1-10] N85-33926
WIGGLER MAGNETS
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794
WIND (METEOROLOGY)
Radar wind profilers in the Colorado network
[PB85-185486] N85-33647
WIND MEASUREMENT
Verification of Doppler sodar measurements --- atmospheric boundary layer
[KNMI-WR-85-2] N85-33645
WIND PROFILES
Method and apparatus for four-beam radar
[PB85-181477] N85-33289
Verification of Doppler sodar measurements --- atmospheric boundary layer
[KNMI-WR-85-2] N85-33645
Radar wind profilers in the Colorado network
[PB85-185486] N85-33647
WIND TUNNEL MODELS
Two-plane balance and slip-ring design N85-33536
WIND TURBINES
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563
WIND VELOCITY
Method and apparatus for four-beam radar
[PB85-181477] N85-33289
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
WIND VELOCITY MEASUREMENT
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
WINDING
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
WINDOWS (APERTURES)
Laser sealed evacuated window glazings
[DE85-000512] N85-33273
WINDOWS (INTERVALS)
Search of the VAXintosh customizing VMS V4.0 for DCL windows
[DE85-011306] N85-33729
WING SPAN
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563
WINGS
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle
[NASA-TP-2467] N85-33107
WIRE
Electromagnetic inspection of wire ropes using sensor arrays
[AD-A155412] N85-33509
Features of the solar array drive mechanism for the space telescope N85-33532
WOLF-RAYET STARS
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003
WORK CAPACITY
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
WORK FUNCTIONS
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
WORK-REST CYCLE
Psychophysiological distinctions of organization and regulation of daily cyclograms of crew activities during long-term spacecraft N85-33669
WORKLOADS (PSYCHOPHYSIOLOGY)
Speech analysis system for assessing pilots' working fitness N85-33661
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
WORLD METEOROLOGICAL ORGANIZATION
The 2nd World Meteorological Association Regional Association (Asia), 8th session
[WMO-642] N85-33643

X

X RAY ANALYSIS
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572
X RAY ASTRONOMY
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
Cyg X-3: Not seen in high-energy gamma rays by COS-B
[OG-2.2-2] N85-33929
Relevance of the observation of UHE gammas to hard X-ray astronomy
[OG-2.2-6] N85-33932
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range
[OG-2.2-10] N85-33936
X RAY BINARIES
Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars
[OG-2.2-5] N85-33931
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range
[OG-2.2-10] N85-33936
X RAY DIFFRACTION
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
X RAY IRRADIATION
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
X RAY SCATTERING
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
X RAY SOURCES
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Comments on RS-17 X-ray telescope N85-33132
Astron X-ray experiment N85-33137
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
Search for periodicities near 59 s in the COS-B gamma-ray data of 2CG195+04 (Geminga)
[OG-2.4-3] N85-33950
A search in the COS-B data base for correlated time variability in regions containing objects of interest
[OG-2.5-9] N85-33964
Radio observations of four anticenter 2CG gamma-ray sources
[OG-2.5-10] N85-33965
Balloon observations of hard X-rays from some galactic X-ray sources
[OG-2.5-11] N85-33966
Further studies of X-ray structure of the Perseus cluster
[OG-2.5-12] N85-33967
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
The 4U 0115+63: Another energetic gamma ray binary pulser
[OG-2.6-11] N85-33973
Balloon observations of hard X-rays from NGC 4151 and an X-ray transient source
[OG-2.7-6] N85-33979
X RAY SPECTRA
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions
[NASA-CR-176090] N85-33897
CEN A observation at MeV-energies
[OG-2.7-7] N85-33980
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1
[MPE-191] N85-34112
X RAY SPECTROSCOPY
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Astron X-ray experiment N85-33137
X-ray spectroscopy of solids under pressure
[DE85-011486] N85-33213
X RAY TELESCOPES
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Comments on RS-17 X-ray telescope N85-33132
Astron X-ray experiment N85-33137
X RAYS
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Results from Astron orbiting telescope N85-33134
Gamma-ray burst variability above 4 MeV
[OG-1.2-7] N85-33917
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
Balloon observations of hard X-rays from some galactic X-ray sources
[OG-2.5-11] N85-33966
Further studies of X-ray structure of the Perseus cluster
[OG-2.5-12] N85-33967
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000

Y

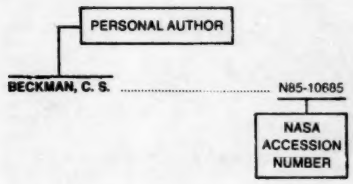
YAG LASERS
Holographic cinematography with the help of a pulse YAG laser
[ISL-CO-213/84] N85-33472
Cinehologrophy
[ISL-CO-214/84] N85-33473
YTTRIUM OXIDES
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828

Z

ZINC
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
ZIRCONIUM OXIDES
Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828
ZONE MELTING
Striation free doped silicon
[AD-A155730] N85-33827

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The NASA accession number denotes the number by which the citation is identified.

A

ABDULLAYEV, Y. R. N85-33374
ABE, Y. N85-33863
ABRAMOV, R. V. N85-33165
ACCOLAS, R. N85-33198
ACHARYA, B. S. N85-34017
N85-34066
ADAIR, E. R. N85-33654
ADELMAN, H. M. N85-33538
AFJEH, A. A. N85-33563
AGAKHANYAN, T. M. N85-33428
AGNEW, S. F. N85-33220
AHARONIAN, F. A. N85-33974
N85-33987
AHLBERG, M. N85-33616
AHLEN, S. P. N85-34040
AHRENS, T. J. N85-33864
AKHIYEZER, A. N. N85-33418
AKHMEDOV, S. A. N85-33149
AKSENOVA, Y. I. N85-33364
AKYNBEKOV, K. U. N85-33665
ALAG, G. S. N85-33122
ALBE, F. N85-33472
N85-33473
ALBERTAZZI, Z. N85-33617
ALDISSI, M. N85-33257
ALDRICH, J. R. N85-33190
ALEKSANDROVA, V. N85-33383
ALEKSEYEV, A. V. N85-33374
ALESSI, J. N85-33777
ALEXANDER, H. N85-33176
ALEXEENKO, V. V. N85-33928
ALFARO-BOU, E. N85-33515
ALFEROVA, A. P. N85-33141
ALI, A. W. N85-33813
ALLEN, B. B. N85-33514
ALLKOFER, O. C. N85-34096
ALLWINE, K. J. N85-33608
ALONSO, J. R. N85-33784
ALSMILLER, R. G., JR. N85-33776
ALTMAN, L. S. N85-33315
ALTSEIMER, J. H. N85-33592
ALVAREZ, M. N85-34042
ALVIAL, G. N85-34034
AMENOMORI, M. N85-34061
AN, S. N85-34110
ANDERSON, D. L. N85-33677
ANDERSON, L. W. N85-33764
ANDERSON, M. E. N85-33786
ANDERSON, R. A. N85-33275
ANDLAUER, G. N85-33890
ANDRE, P. N85-33958
ANDREWS, W. H., JR. N85-33460
ANDRYUKHIN, S. P. N85-33364
ANTHONY, J. R. N85-33267
APANASENKO, Z. I. N85-33679
APPARAO, K. M. V. N85-34092
APTEKAR, R. L. N85-33905
ARCHULETA, F. I. N85-33232
ARDEMA, M. D. N85-33745
ARGABRIGHT, T. A. N85-33441
ARIAS, T. A. N85-33848
ARKERYD, L. N85-33748
ARKHANGELSKIY, G. A. N85-33391
ARMSTRONG, R. W. N85-33572
N85-33573
ARNOLD, C., JR. N85-33259
ARNOULD, M. N85-34003
ARRHENIUS, G. N85-33858
ARTEMENKOV, V. S. N85-33323
ARZUMANYAN, Y. V. N85-33339
N85-33398
ASAY, J. R. N85-33445
ASEIKIN, V. S. N85-33939
ASHURST, W. T. N85-33210
ASYAMOLOVA, N. M. N85-33677
ATAYANTS, B. A. N85-33399
ATOYAN, A. M. N85-33987
ATTALLA, A. N85-33772
ATTEIA, J. L. N85-33912
N85-33915
AUCHAMPAUGH, G. F. N85-33775
AVAKYAN, O. M. N85-33689
AVDEYEV, S. I. N85-33687
AVESTON, J. N85-33195
AXNESS, C. L. N85-34111
AYZIKOV, G. S. N85-33690
AYZIN, F. L. N85-33328

B

BABIN, A. M. N85-33140
BADHWAR, G. D. N85-34007
N85-34104
BAKER, D. N. N85-33898
N85-33899
BAKHAMATOV, A. Y. N85-33150
BALABAN, D. J. N85-33723
BALABANOV, B. N85-33383
BALASUBRAHMANYAN, V. K. N85-34017
N85-34018
BALAZARD, J. N85-33120
BALEIX, A. N85-33222
BALLARD, E. O. N85-33793
BALLMOOS, P. V. N85-33980
BALTER, B. M. N85-33157
BALTRUSAITIS, R. M. N85-33933
N85-33968
N85-34044
N85-34049
N85-34071
BANITE, D. K. N85-33378
BARABOY, V. A. N85-33663
BARANOV, V. M. N85-33677
BARAT, C. N85-33912
N85-33915
BARGATZE, L. F. N85-33899
BARGER, M. J. N85-33293
BARHEN, J. N85-33503
BARKER, L. M. N85-33445
BARNES, J. M. N85-33776
BARNHILL, M. V., III N85-33930
BARSKIY, N. N85-33130
BARTHELMY, S. D. N85-34013
BARTLETT, D. W. N85-33116
BARTON, C. N. N85-33694
BARTON, D. N85-33777
BASHKATOVA, S. T. N85-33376
BASINA, Y. V. N85-34020
BASSANI, L. N85-33965
BATCHELOR, D. B. N85-33825
BATORY, D. S. N85-33737
BATTISTONI, G. N85-33920
N85-34047
BAUER, V. N85-33383
BAUGHCUM, S. L. N85-33219
BAXTER, B. H. N85-33523
BAYEVSKIY, R. M. N85-33142
BAZUMOVSKIY, Y. K. N85-33666
BEATTY, J. J. N85-34021
BECKER, R. H. N85-33853
N85-34109
BEENE, J. R. N85-33479
BEERS, R. H. N85-33638
BEESTON, J. M. N85-33234
BEHL, W. K. N85-33575
BEISINGER, Z. E. N85-33714
BELJAARS, A. C. M. N85-33645
BELKANIYA, G. S. N85-33673
N85-33688
BELLOTTI, E. N85-33920
N85-34047
BELOTSERKOVSKIY, A. S. N85-33356
BEMIS, C. E., JR. N85-33479
BENIGNUS, V. A. N85-33694
BENKO, E. N85-33293
BENNETT, K. N85-33929
N85-33950
N85-33997
BENNETT, L. F. N85-33275
BENNETT, S. N85-33506
BENSON, D. K. N85-33273
N85-33302
BENSON, S. M. N85-33598
BENTALL, R. H. N85-33516
BENTON, M. D. N85-33513
BERDAHL, P. H. N85-33303
BEREZIN, S. V. N85-33369
BEREZINSKY, V. S. N85-33911
N85-33924
N85-33988
BERGDAL, H. N85-33288
BERGER, M. H. N85-33394
BERGH, J. N85-33748
BERKOWITZ, J. N85-33478
BERLEY, D. N85-34059
BERNADSKIY, V. I. N85-33141
BERNARDI, A. N85-33627
BERNER, C. N85-33450
BERNSTEIN, R. L. N85-33651
BERRY, D. F. N85-33659
BERTO, S. N85-33383
BHAT, C. L. N85-33926
N85-33949
N85-33996
N85-33998
N85-33999
BHAT, P. N. N85-33919
N85-33941
N85-33942
N85-33947
N85-33953
N85-33976
BHATTACHARYYA, J. C. N85-33909
BHISE, R. S. N85-33499
BIGELOW, T. S. N85-33825
BIGNAMI, G. F. N85-33929
N85-33950
N85-33997
BILGER, R. W. N85-33211
BINNS, W. R. N85-34014
N85-34038
N85-34039
BIS, R. F. N85-33574
BISWAS, S. N85-34010
N85-34092
BITNER, E. D. N85-33475
BJARKE, G. O. N85-33300
BJORKEN, J. D. N85-33790
BLACK, M. D. N85-33283
BLAIR, D. G. N85-34076
BLAKE, P. L. N85-33684
BLAKE, P. R. N85-33921
N85-34050
BLAKE, R. D. N85-33254
BLANK, M. L. N85-33656
BLITZ, L. N85-33994
BLOEMEN, J. B. G. M. N85-33929
N85-33990
N85-33991
N85-33994
N85-33997
BLOISE, C. N85-33920
N85-34047
BOBIN, L. N85-33451
BODVARSSON, G. S. N85-33587

BOE, L. J. N85-33285
BOEGLI, W. J. N85-33194
BOENIG, H. J. N85-33832
BOGACHEV, A. S. N85-33318
BOGERT, M. C. N85-34060
BOGOMOLOV, E. A. N85-34101
BOHACHEVSKY, I. O. N85-33446
BOICOURT, G. P. N85-33758
BOITNOTT, R. L. N85-33546
BOLLAG, J. M. N85-33659
BOLOGNA, G. N85-33920
N85-34047
BOND, V. P. N85-33657
BONDARENKO, A. R. N85-33421
BONFANTI, G. N85-33617
BOOTH, T. E. N85-33742
BOOZER, A. N85-33815
BORDEN, P. G. N85-33584
BORGEFORS, G. N85-33558
BORGNAKKE, C. N85-33502
BORIO, R. N85-33471
BOWEN, T. N85-34094
BOWMAN, C. D. N85-33775
BOYKO, Y. P. N85-33377
BRADBURY, J. N. N85-33773
BRADFORD, K. Z. N85-33175
BRAGIN, M. O. N85-33666
BRASHEAR, J. P. N85-33559
BRASSEUR, G. N85-33621
BRATIVNK, Y. G. N85-33321
BRAUN, R. N85-34109
BRECHER, K. N85-33931
BREGOLI, L. J. N85-33311
BREIDENTHAL, G. N85-33573
BRILLIANTOV, D. P. N85-33321
BRINNER, A. N85-33468
BROCKHAUSEN, D. N85-34096
BRODD, S. S. N85-33738
BRODZINSKI, R. L. N85-33766
BROOKE, G. N85-34045
BROWN, D. R. N85-33597
BROWN, H. N85-33777
N85-33788
BROWN, J. N85-33557
BROWN, R. R. N85-33292
BROWNING, R. V. N85-33707
BRUCE, T. E. G. N85-34076
BRUNCHENKO, A. V. N85-33340
BRUNNE, M. N85-33485
BRUNO, R. N85-33844
BRYANTSEVA, L. A. N85-33679
BUCCHERI, R. N85-33929
N85-33950
N85-33964
N85-33997
BUDDEMEIER, R. W. N85-33606
BUDINGER, T. F. N85-33779
BUFFINGTON, A. N85-34033
BUKSHNAYTIS, I. V. N85-33378
BUL, B. K. N85-33374
BULLARD, E. M. N85-33638
BULLOCK, J. S. N85-33578
BUMPUS, S. N85-33724
BUNCH, J. N85-33231
BURATTI, B. J. N85-33871
BURKE, W. F. N85-33459
BURKHARDT, C. E. N85-33755
BURKOVSKAYA, T. Y. N85-33680
BURNETT, T. H. N85-34015
N85-34019
BURNS, D. J. N85-33298
BURNSTEIN, R. N85-34060
BURSON, Z. G. N85-33638
BUSH, G. N85-33518
BUSH, H. G. N85-33181
BUSSELL, G. T. N85-33805
BUTLER, D. H. N85-33514
BYCHKOV, S. I. N85-33429
BYKOV, V. L. N85-33383
BYRD, J. S. N85-33500
BYRNE, W. P. N85-33455

C

CADY, R. N85-34044
N85-34071
CAHEN, D. N85-33576
CAHENDERSON, L. N85-33291
CAMBRON, T. M. N85-33115
CAMPANA, P. N85-33920
N85-34047
CAMPBELL, R. B. N85-33568
CAMPOSVENUTI, G. N85-33471
CANNON, R. H., JR. N85-33176
CANTRELL, B. H. N85-33282
CAPUTO, A. J. N85-33255
CARAVEO, P. A. N85-33929
N85-33950
N85-33964
N85-33997
CARLSON, L. W. N85-33438
CARLSON, P. A. N85-33702
CARRERAS, R. A. N85-33735
CARRUTH, M. R., JR. N85-33567
CARVIN, N. A. N85-33283
CASKEY, G. R., JR. N85-33235
CASSE, M. N85-34003
CASSIDAY, G. I. N85-34071
CASSIDAY, G. L. N85-33933
N85-33968
N85-34044
N85-34049
CASTAGNOLI, C. N85-33920
N85-34047
CASTELLINA, A. N85-33920
N85-34047
CAUSSADE, B. N85-33222
CAWLEY, M. F. N85-33927
N85-33935
N85-33938
N85-33951
N85-33977
CAWLEY, W. E. N85-33465
CENIAN, A. N85-33485
CHADWICK, P. M. N85-33925
N85-33946
N85-33948
N85-33973
CHADWICK, R. B. N85-33289
CHANCE, M. S. N85-33814
CHANDLER, T. J. N85-33307
CHANMUGAM, G. N85-33931
CHANMUGATHAS, P. N85-33659
CHAPAYEV, A. V. N85-33672
CHAPMAN, C. R. N85-33857
N85-33861
CHART, T. G. N85-33229
CHELNAYA, N. A. N85-33679
CHELTON, D. B. N85-33651
CHEN, C. Y. N85-33206
CHEN, D. Y. N85-33294
CHEN, J. N85-33293
CHEN, J. P. N85-33693
CHEN, Y. W. N85-33576
CHENG, W. K. N85-33297
CHERNYAKOV, M. S. N85-33319
CHESSMORE, R. B. N85-33785
CHEUNG, T. N85-34068
CHEW, E. W. N85-33611
CHHABILDAS, L. C. N85-33548
CHIANG, I. H. N85-33788
CHIARELLA, V. N85-33920
N85-34047
CHILES, H. R. N85-33121
CHILES, M. M. N85-33822
CHISTYAKOV, N. I. N85-33407
CHOLEWICKI, I. N85-33375
CHRISTENSEN, J. P. N85-33589
CHRISTENSEN, S. W. N85-33695
CHRISTIAN, E. C. N85-34033
CHRISTON, S. P. N85-33875
CHUDAKOV, A. E. N85-33928
CHUPP, E. L. N85-33955
N85-34001
CHURCH, H. W. N85-33648
CHURYUMOV, K. I. N85-33138
CINQUINI, P. N85-34076
CIOCIO, A. N85-33920
N85-34047
CISZEK, T. F. N85-33249
N85-33494
N85-33829
CLARK, E. N85-33640
CLAUSING, J. A. N85-33706
CLAY, R. W. N85-33972
N85-34067
N85-34076
N85-34077
N85-34087
CLEAR, J. N85-33964
CLIFTON, P. M. N85-33556
CLINE, T. L. N85-33910
N85-33912
N85-33915
N85-33916
N85-33936
CLOSE, D. A. N85-33454
COBBLE, J. A. N85-33825
COFFELT, K. P. N85-33781
COHEN, A. N85-33174
COHEN, D. N85-33545
COHEN, R. S. N85-33994
COLE, R. N85-33248
COLOMBO, P. N85-33799
COLTON, E. P. N85-33760
COMBI, M. R. N85-33848
CONN, H. N85-33710
COOK, W. E. N85-33505
COOPER, D. E. N85-33545
COOPER, P. A. N85-33181
COOPER, R. N85-33968
N85-34044
N85-34049
N85-34071
COOPER, R. K. N85-33784
COPPER, R. N85-33933
COREY, R. L. N85-33755
CORNELIUS, W. D. N85-33757
CORREA, S. M. N85-33212
COTTINGAME, W. B. N85-33758
COURANT, E. N85-33788
COWSIK, R. N85-34103
COX, J. M. N85-33455
COZZANI, F. N85-33818
CRAFTS, J. L. N85-33169
CRAIG, R. R., JR. N85-33542
N85-33544
N85-33747
CRAWFORD, H. J. N85-34027
CREMERS, D. A. N85-33232
CROSBY, W. N85-33693
CROWLEY, W. P. N85-33442
CUMMINGS, P. N85-33280
CUNDY, D. N85-33920
N85-34047
CUNNINGHAM, C. H. N85-33589
CUNNINGHAM, G. N85-34045
CZANDERNA, A. W. N85-33495

D

DAHLBERG, B. E. J. N85-33749
DAI, C. N85-33944
DAKE, S. N85-34015
N85-34019
DAME, T. M. N85-33994
DAMLE, S. V. N85-33966
N85-33979
N85-33981
DANIEL, R. R. N85-34007
N85-34104
DAREE, K. N85-33486
DARTSMELIYA, V. A. N85-33673
DAULTON, T. L. N85-33755
DAVIES, W. J. N85-33631
DAVIS, A. H. N85-33434
DAVIS, D. R. N85-33857
N85-33861
DAVIS, M. S. N85-33765
DAVIS, R. C. N85-33597
DAVYDENKO, V. V. N85-33359
DAWSON, B. R. N85-34067
N85-34076
DEAN, A. J. N85-33985
DEAN, E. B. N85-33181
DEBANY N85-33458
DEDENKO, L. I. N85-34055
DEGLIESPOSTI, P. N85-33471
DEMUTH, R. B. N85-33443
DENISOV, V. P. N85-33372
DENISOVA, L. A. N85-33679
DERENZO, S. E. N85-33779
DERIDDER, A. N85-33642
DERMER, C. D. N85-34095
DEROOS, F. L. N85-33620
DERRICKSON, J. H. N85-34012
N85-34015
N85-34019
DESAUSSURE, G. N85-33503
DESHAZER, L. G. N85-33631
DEUPREE, R. G. N85-33434
DICKERSON, M. H. N85-33603
DICKSON, R. L. N85-33611
DIEHL, J. W. N85-33215
DIEHL, R. N85-33980
DIETDERICH, D. R. N85-33308
DILLON, W. N85-33295
DILWORTH, H. C. N85-33232
DIMOTAKIS, P. E. N85-33207
DINSDALE, A. T. N85-33229
DIPPER, N. A. N85-33973
DIRKS, J. A. N85-33596
N85-33597
DOBROWOLNY, M. N85-33844
DOBSON, P. H. N85-33276
DOKE, T. N85-34035

DOLGINOV, S. S. N85-33891
N85-33892
DOLGIY, A. V. N85-33388
DONIVAN, S. N85-33785
DOOM, C. N85-34003
DORSEY, J. T. N85-33181
DORUK, M. N85-33243
DOUGLAS, B. N85-33878
DOWDY, E. J. N85-33780
DOWNS, R. L. N85-33250
DOWNWARD, J. G. N85-33729
DOWTHWAITE, J. C. N85-33925
N85-33946
N85-33948
N85-33973
DRACH, J. N85-34040
DRAKE, M. C. N85-33208
DRELLACK, S. L., JR. N85-33631
DRISCHLER, J. D. N85-33776
DUKE, E. L. N85-33122
DUNN, C. D. R. N85-33693
DURGAPRASAD, N. N85-34010
N85-34092
DUROUCHOUX, P. N85-33936
DUWELZ, A. N85-33277
DVIGANTSEV, S. N85-33661
DYAKONOV, M. N. N85-34054
N85-34056
DZIKOWSKI, T. N85-33969

E

EAKIN, D. E. N85-33803
EAMES, P. J. V. N85-34045
EAMES, P. V. J. N85-34073
EARLEY, M. W. N85-33276
EARSOM, D. L. N85-33755
EBERSOLE, J. F. N85-33297
EBIHARA, B. T. N85-33489
ECKELS, D. E. N85-33214
EDWARDS, T. R. N85-33701
EFIMOV, N. N. N85-34055
N85-34058
N85-34091
EFREMOV, N. N. N85-34055
EGOROV, T. A. N85-34058
EICHELBERGER, C. P. N85-33515
EICHLER, D. N85-33934
ELBERT, J. W. N85-33933
N85-33968
N85-34044
N85-34049
N85-34071
N85-34086
ELLER, P. G. N85-33202
ELLIG, D. L. N85-33193
ELLISON, D. C. N85-34080
ELLISON, J. F. N85-33118
ELLSWORTH, R. W. N85-34059
N85-34060
ELMAN, R. I. N85-33158
EMERY, K. A. N85-33599
EMERY, V. J. N85-33770
EMIN, D. N85-33260
EMMETT, M. B. N85-33718
ENFIELD, S. N85-33841
ENGEBRETSEN, A. R. N85-33589
ENGELDER, P. R. N85-33785
ENGELMANN, J. J. N85-34008
N85-34009
EOFF, J. M. N85-33504
EPSTEIN, M. N85-33279
ESHERICK, P. N85-33218
ESTEY, L. N85-33878
ESTRADA, M. R. N85-34042
EVANS, W. D. N85-33912
N85-33915
EVENSON, P. N85-34022
EVERETT, S. L., JR. N85-33811

F

FADEYEV, A. N. N85-33410
FAGOT, H. N85-33472
N85-33473
FAN, Z. N85-33944
FARKAS, Z. D. N85-33792
FARNUM, E. H. N85-33166
FARREN, J. N85-33833
FARRINGTON, R. B. N85-33561
N85-33562
FASANELLA, E. L. N85-33515
FAURE, A. N85-33277
FEARON, E. M. N85-33606
FEDORUK, V. G. N85-33347
FEGAN, D. J. N85-33927
N85-33935
N85-33951
N85-33977
FEIGELSON, E. D. N85-33958
FEIGENBAUM, I. N85-33778
FELLERHOFF, J. R. N85-33115
FENIMORE, E. E. N85-33904
N85-33912
N85-33915
FERGUSON, H. N85-33710
FERNSLER, R. F. N85-33812
FERRALL, C. N85-33884
FERRANDO, P. N85-34008
N85-34009
N85-34031
FICHTEL, C. E. N85-34081
N85-34082
FIKANI, M. M. N85-33904
FILATOV, N. I. N85-33363
FISHER, J. J. N85-33500
FLANNERY, B. P. N85-33641
FLAUM, M. N85-33487
FLEMING, D. P. N85-33490
FLUSS, M. J. N85-33769
FOA, O. N85-33964
FOMIN, Y. A. N85-33975
FONASH, S. J. N85-33571
FORBES, R. B. N85-33837
FORREST, D. J. N85-33955
N85-34001
FOSTER, P. A. N85-33267
FOUNTAIN, W. F. N85-34015
N85-34019
FOUQUET, M. N85-33183
FOWLER, P. H. N85-34036
N85-34037
FOX, G. N85-33444
FRADKIN, M. I. N85-33981
FRANK, J. A. N85-33592
FRANKS, L. A. N85-33454
FRASER-SMITH, A. C. N85-33627
FRECER, J. E. N85-33908
FREDERICKSON, J. R. N85-33492
FREITAS, R. A., JR. N85-33702
FREUDENREICH, H. N85-34060
FREUDENREICH, H. T. N85-34059
FREYDIN, B. P. N85-33350
FRIEDMAN, G. M. N85-33554
FRIIS-CHRISTENSEN, E. N85-33845
FROLKIN, V. T. N85-33343
N85-33355
FROLOV, S. M. N85-33325
FROSCH, R. A. N85-33173
FRYER, P. N85-33884
FU, C. Y. N85-33808
FU, J. S. N85-34111
FUKI, M. N85-34015
N85-34019
FUKUDA, Y. N85-33199
FULLAM, H. T. N85-33609

G

GADDIS, L. R. N85-33884
GAISSER, T. K. N85-33930
GAISSNER, T. K. N85-34049
GALAKTIONOVA, G. V. N85-33686
GAMPE, F. N85-33516
GANGL, K. J. N85-33566
GANZORIG, M. N85-33157
GARCIA-MUNOZ, M. N85-34026
GARDNER, C. N85-33788
GARRARD, T. L. N85-34014
N85-34038
N85-34039
GARVER, W. P. N85-33755
GASSANOV, P. N85-33415
GATES, G. N85-33498
GAULKE, S. W. N85-33587
GAVLIN, M. E. N85-33329
GAWIN, J. N85-33969
N85-34083
GAY, A. M. N85-34036
N85-34037
GAY, G. T. N85-33648
GAZENKO, O. G. N85-33139
GEAR, C. W. N85-33740
GEHRELS, N. N85-33908
GEHRELS, T. N85-33908
GEHRINGER, P. N85-33615
GELDZAHLER, B. J. N85-33955
GENIN, A. M. N85-33677
GEORGE, J. N85-33222
GERDES, J. W. N85-33184
GERHARD, M. A. N85-33724
GERHARDY, P. R. N85-33933
N85-33968
N85-34044
N85-34049
N85-34071
N85-34077
GERSHBERG, A. Y. N85-33333
GIBBS, K. N85-33927
N85-33938
N85-33951
N85-33977
GIBBS, K. G. N85-33935
GILL, D. H. N85-33481
GILL, P. E. N85-33711
GILMORE, R. F. N85-33496
GINZBURG, V. L. N85-33988
GIPTA, G. K. N85-33740
GLAZER, J. N85-33308
GLUSHANKOV, Y. I. N85-33359
GLUSHKO, Y. V. N85-33164
GLUSHKOV, A. V. N85-34055
N85-34058
GOATES, S. R. N85-33221
GODFREY, C. P. N85-33940
GODLEVSKIY, V. S. N85-33346
GOEBEL, R. P. N85-33658
GOETTEL, K. A. N85-33876
GOKCEN, N. A. N85-33560
GOLDEN, R. L. N85-34007
N85-34024
N85-34104
GOLDHAR, J. N85-33310
GOLDMAN, T. N85-33795
GOLDSTEIN, B. E. N85-33875
GOLDSTEIN, N. E. N85-33630
GOLENETSKII, S. V. N85-33905
GOLES, R. W. N85-33610
GOLINSKAYA, R. M. N85-34020
GOLOVIN, E. S. N85-33402
GOLOVINA, A. P. N85-33333
GOLUBEVA, Y. G. N85-33691
GONED, A. N85-33993
GONZALES, J. L. N85-33631
GOODMAN, J. A. N85-34059
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GOODMAN, M. C. N85-34060
GOODMAN, R. E. N85-33628
GOPALAKRISHNAN, N. V. N85-33970
GORET, P. N85-34031
GORGES, W. N85-33698
GORHAM, P. W. N85-33927
N85-33935
N85-33938
N85-33951
N85-33977
GORSHKOV, V. P. N85-33682
GOUGH, R. A. N85-33784
GRABELSKY, D. A. N85-33994
GRADIE, J. N85-33856
GRASEGGER, S. N85-33550
GRAY, C. E. N85-33607
GREBENKO, Y. A. N85-33341
GREBENKOV, N. V. N85-33353
GREELEY, R. N85-33869
GREEN, R. M. N85-33268
GREENBERG, R. N85-33857
N85-33861
GREENE, J. P. N85-33478
GREENFIELD, H. T. N85-33533
GREENLY, G. D. N85-33603
GREENWOOD, W. J. N85-33195
GREGORY, A. G. N85-34048
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GREGORY, J. C. N85-34012
N85-34015
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GREINER, D. E. N85-34027
GREINER, N. R. N85-33220
GRIEDER, P. K. F. N85-34063
GRIGGS, K. S. N85-33606
GRIGOROV, N. L. N85-34020
GRIGORYEV, A. M. N85-33365
GRIGORYEVA, L. B. N85-34020
GRIMM, R. C. N85-33814
GRINEV, A. Y. N85-33326
GROCHALSKA, B. N85-33969
GROENWALD, J. N85-33636
GROLMES, M. A. N85-33279
GROMME, T. N85-33720
GROMOV, M. V. N85-33423
GROS, M. N85-34003
GROVE, J. E. N85-34033
GROVER, J. M. N85-33497
GRUBER, D. E. N85-34000

GRUTZECK, M. W. N85-33263
GRYANIK, M. V. N85-33386
GU, Y. N85-33944
GUDIKSEN, P. H. N85-33603
GUENTHER, H. N85-33754
GUILLOT, J. N85-33264
GUPTA, S. N85-33565
GUPTA, S. C. N85-34060
GUPTA, S. K. N85-33941
N85-33942
N85-33947
N85-33953
N85-33976
GURYAN, Y. A. N85-33905
GURYEVA, T. S. N85-33691
GUSAK, N. A. N85-33366
GUSELNIKOV, V. K. N85-33368
GUSTAFSSON, T. N85-33226
GUZIK, T. G. N85-34026
N85-34027

H

HAAS, R. A. N85-33483
HAAS, W. J., JR. N85-33214
HAERTIG, J. N85-33451
HAFTKA, R. T. N85-33538
HAGAMAN, J. A. N85-33168
HAGENBUCHNER, K. N85-33200
HAGER, B. H. N85-33888
HAGIWARA, K. N85-34069
HAGSTRON, R. T. N85-33706
HALE, B. D. N85-33578
HALL, B. P. N85-33523
HALLARON, T. N85-33640
HALLETT, J. N85-33297
HALZEN, F. N85-33930
HAMASAKI, R. N85-34035
HAMEL, W. R. N85-33503
HAMILTON, D. S. N85-33482
HAMILTON, L. D. N85-33696
HAMM, R. N. N85-33822
HANE, G. J. N85-33230
HANEY, J. L. N85-33613
HANLEY, H. J. M. N85-33227
HANSEN, A. M. N85-33768
HARA, T. N85-33922
N85-34070
HARDING, A. K. N85-33992
HARKNESS, S. N85-33291
HARPER, W. H. N85-33492
HARRAH, L. A. N85-33767
HARRIS, S. L. N85-33854
HART, M. M. N85-33106
HASSENZAHL, W. V. N85-33308
HASTI, D. E. N85-33275
HATANO, Y. N85-33922
N85-34070
HAVEL, J. N85-33809
HAWKE, R. S. N85-33501
HAYASHI, T. N85-34015
N85-34015
N85-34019
N85-34035
HAYASHIDA, N. N85-33922
N85-34043
N85-34070
N85-34072
HAYES, J. M. N85-33189
HAZELTON, R. F. N85-33796
HE, C. X. N85-34043
HEAD, R. N85-33522
HEATH, M. T. N85-33717
HEATON, R. C. N85-33781
HELLSTROM, E. E. N85-33256
HEMSEN, W. N85-33991
HENESIAN, M. A. N85-33310
N85-33483
HEPBURN, J. C. N85-33634
HERMSEN, W. N85-33929
N85-33950
N85-33994
N85-33997
HERRMANNSFELDT, W. B. N85-33480
HERRSTROEM, N. Y. N85-34032
HERZOG, M. N85-33640
HETRICK, D. M. N85-33808
HEUER, A. H. N85-33261
HEYMANN, M. N85-33745
HIGASHI, S. N85-34065
HIGDON, J. C. N85-33913
N85-34002
N85-34004
HILDE, T. W. C. N85-33632
HILL, H. A. N85-33900
HILLAS, A. M. N85-34084
HILLIS, D. L. N85-33825
HIPPENSTEELE, S. A. N85-33435
HIRTH, A. N85-33488
HISANO, K. N85-34035
HOEFER, C. S. N85-33831
HOEH, A. N85-33226
HOF, D. N85-33219
HOFF, D. L. N85-33611
HOFFERT, M. I. N85-33641
HOGAN, J. N85-33841
HOHLFELD, R. G. N85-33297
HOLDREN, M. W. N85-33620
HOLLSTEIN, E. J. N85-33191
HOLMES, N. C. N85-33896
HOLYNSKI, R. N85-34015
N85-34019
HONDA, M. N85-33922
N85-34043
N85-34070
N85-34078
N85-34079
HONIG, A. N85-33800
HOOD, R. V. N85-33116
HOOKER, C. D. N85-33469
HOPKINS, D. C. N85-33294
HORAN, S. N85-34007
N85-34104
HORTON, T. W. N85-33123
HORTON, W. N85-33818
HOSTENKAMP, R. G. N85-33532
HOTTA, N. N85-34061
HOUSNER, J. M. N85-33539
HOUSTON, B. P. N85-33999
HOVENIER, J. W. N85-33872
HOWELL, R. H. N85-33769
HOWERTON, R. J. N85-33768
HOWRY, S. N85-33720
HOWSMAN, T. G. N85-33542
HSEUH, H. C. N85-33778
HSIEH, A. J. Y. N85-33196
HUETER, G. J. N85-33903
HUGHES, R. C. N85-33259
HUGUENIN, R. L. N85-33854
HUI, B. N85-33812
HUNKLER, R. N85-33731
N85-33741
HUNT, J. L. N85-33806
HURLEY, K. N85-33912
N85-33915
HURST, G. S. N85-33822
HUVE, J. L. N85-33600
HYER, M. W. N85-33545
N85-33547

I

IGARASHI, G. N85-33852
IGNATYEV, A. A. N85-33340
IGNATYEV, N. K. N85-33332
ILARIONOV, Y. A. N85-33422
ILIN, V. N. N85-33342
ILYINSKII, V. N. N85-33905
IMBERT, M. D. N85-33277
INGALLS, R. L. N85-33213
INGOGLY, W. F. N85-33708
INOUE, N. N85-34069
IODKO, M. G. N85-34101
IOTT, J. N85-33538
ISHCHUK, A. A. N85-33394
ISHIKAWA, F. N85-34043
ISLER, R. E. N85-33716
ISRAEL, M. H. N85-34013
N85-34014
N85-34038
N85-34039
ITO, K. N85-34035
ITSEKHOVSKIY, O. G. N85-33141
IVANCHENKO, I. V. N85-33412
IVANENKO, I. P. N85-34020
IVANOV, A. A. N85-34054
N85-34056
IVANOV, A. V. N85-33384
IVANOV, V. G. N85-33358
IVANOV, V. I. N85-33376
IVEY, M. D. N85-33648
IWAI, J. N85-34015
N85-34019
IYUDIN, A. F. N85-33981

J

JACKSON, A. N85-33699
JACOBSON, A. S. N85-33917
N85-33954
N85-33956
N85-34002
JACQUEMIN, G. G. N85-33517
JAEGGY, B. C. N85-33451
JAN, J. N85-33344
JANMINCHEV, V. D. N85-33939
N85-34062
JANOSKI, E. J. N85-33191
JANSEN, F. A. N85-34109
JARDIN, S. C. N85-33814
JATKO, W. B. N85-33304
JENG, D. R. N85-33563
JENKINS, L. M. N85-33525
JENKINS, M. L. N85-33307
JENSEN, A. L. N85-33648
JENSEN, G. A. N85-33796
JOENS, H. P. N85-33870
JOHNSON, D. H. N85-33652
JOHNSON, D. R. N85-33185
JOHNSON, E. R. N85-33546
JOHNSON, J. B. N85-33121
JOHNSON, J. E. N85-33476
JOHNSON, J. J. N85-33724
JOHNSON, P. C. N85-33693
JOHNSON, R. G. N85-33618
N85-33619
JOHNSON, R. H. N85-33280
JOHNSON, S. M. N85-33572
N85-33573
JOHNSON, W. A. N85-33715
JOHNSTON, S. C. N85-33203
JONES, E. E. N85-33275
JONES, F. C. N85-33901
N85-33902
N85-34006
JONES, H. M. N85-33519
JONES, M. D. N85-34014
JONES, W. V. N85-34019
JORGENSEN, C. N85-33503
JORGENSEN, G. J. N85-33273
JOVANIC, M. N85-33294
JUNG, G. V. N85-33963
N85-34000

K

KABANOV, A. I. N85-33417
KABESHEVA, T. A. N85-33675
KACHINSKI, R. N85-33152
KADYRALIYEV, A. K. N85-33664
KAKIMOTO, F. N85-34069
KAKURIN, L. I. N85-33140
KALASHNIKOV, R. V. N85-33370
KALASHNIKOV, V. A. N85-33427
KALB, P. D. N85-33799
KALITA, N. F. N85-33681
KAMATA, K. N85-33922
N85-34043
N85-34070
N85-34079
KAMIDE, Y. N85-33845
KANBACH, G. N85-33997
KANE, S. R. N85-33904
KANEKO, T. N85-34069
KANENKO, R. S. N85-33537
KANTOR, L. Y. N85-33382
KAPILEVICH, B. Y. N85-33394
KAPLAN, S. N. N85-33764
KAPLANSKIY, A. S. N85-33680
KARAKULA, S. N85-33907
N85-33978
N85-33984
N85-34085
KARPPI, R. N85-33551
KARPUKOV, L. M. N85-33352
KASAHARA, K. N85-34061
KASTING, J. F. N85-33865
KASTURIRANGAN, K. N85-33909
KATKYAVICHYUS, V. I. N85-33378
KATSNELSON, L. Z. N85-33354
KAUL, R. K. N85-33949
KAULA, W. M. N85-33680
N85-33689
KAVETSKI, A. N85-33383
KAZAKOV, A. I. N85-33367
KAZAKOV, D. L. N85-33335
KAZAKOV, N. F. N85-33145
KAZAKOVA, P. B. N85-33680
KAZANAS, D. N85-33982
KEETON, D. C. N85-33713
KEHOE, M. W. N85-33118
KEIL, J. N85-33110
KEITH, T. G., JR. N85-33563
KELMAN, Y. S. N85-33354
KEMPA, J. N85-34083

KEMPEL, R. W. N85-33123
KENIG, C. E. N85-33749
KENNY, S. N85-33935
KENOYER, J. L. N85-33469
KEPLER, R. G. N85-33259
KERTZMAN, M. P. N85-34039
KHAERDINOV, N. S. N85-33928
KHARIN, G. M. N85-33680
KHNYKIN, V. I. N85-33154
KHOROSHILOVA-MASLOVA, I. P. N85-33680
KHRISTIANSEN, G. B. N85-33975
N85-34058
KIDD, M. E. N85-33271
KIEFER, W. S. N85-33888
KIFUNE, T. N85-33922
N85-34070
N85-34072
N85-34078
N85-34079
KILLOUGH, G. G. N85-33639
KILLUS, J. P. N85-33618
N85-33619
KIM, K. S. N85-33540
N85-33541
KIMBELL, B. N85-34007
KIMREY, H. D. N85-33825
KING, A. N85-33720
KINGSTON, M. L. N85-33839
KINZER, R. L. N85-33955
N85-34000
N85-34001
KIRBY, K. W. N85-33831
KIRILLOV-UGRYUMOV, V. G. N85-33981
KIRK, M. A. N85-33307
KIRKHAM, R. R. N85-33462
KIRKMAN, I. W. N85-33925
N85-33946
N85-33948
N85-33973
KIROV, I. N. N85-33939
KISELEV, A. Z. N85-33317
KISELEV, V. A. N85-33346
KISH, J. C. N85-34011
N85-34029
KLANG, E. C. N85-33547
KLARMANN, J. N85-34013
N85-34014
N85-34038
N85-34039
KLEBESADEL, R. W. N85-33904
N85-33912
N85-33915
KLEINHAUSS, G. N85-33696
KLEMP, J. B. N85-33649
KLIMENKO, O. Y. N85-33156
KLYUSHNIKOVA, G. N. N85-33690
KNIGHT, F. K. N85-33963
KNURENKO, S. P. N85-34054
N85-34057
KO, P. R. N85-34044
KO, S. N85-34071
KOBAYASHI, S. N85-34035
KOBAYASHI, T. N85-34061
KOBLOVA, M. M. N85-33380
KOCH-MIRAMOND, L. N85-34008
N85-34009
N85-34031
N85-34109
KOCH, C. C. N85-33253
KOCHER, D. C. N85-33639
KOCHNEV, A. V. N85-33375
KOCIMSKI, S. M. N85-33454
KODA, N. J. N85-33826
KOENEKE, A. N85-33450
KOGAN, V. L. N85-33356
KOHNO, Y. N85-33199
KOIDA, K. N85-33199
KOLLMANN, W. N85-33205
KOLODIY, N. V. N85-33154
KOLOSOV, V. A. N85-34054
N85-34056
KOMAR, V. G. N85-33426
KONDASHEVSKAYA, M. V. N85-33662
KONDOS, P. N85-33248
KONDRATYEVA, T. I. N85-33164
KONDRATYEVA, Y. M. N85-33684
KONDRATYUK, V. A. N85-33685
KONISHI, E. N85-34061
KONOLIGE, K. N85-33733
KONOVALOV, B. N85-33135
KONSTANTINOV, N. N85-33147
KOPANEV, S. V. N85-33675
KOPP, M. K. N85-33463
KOPROVA, L. I. N85-33150
KOPYL, I. V. N85-33162
KOREJWO, J. N85-33969
KORSHUNOV, Y. M. N85-33320
KORSHUNOVA, G. I. N85-33333
KOSHELEV, V. B. N85-33662
KOTOV, A. N. N85-33677
KOTOV, Y. D. N85-33981
KOZAN, B. L. N85-33328
KOZHEVNIKOV, V. A. N85-33375
KOZODEROV, V. V. N85-33156
KPONOU, A. N85-33777
KRACHER, A. N85-33855
KRASILNIKOV, A. D. N85-34057
KRASILNIKOV, D. D. N85-34054
N85-34056
N85-34057
KRASNOV, L. M. N85-33397
KRAVTSOVA, V. I. N85-33163
KREMER, A. I. N85-33322
KREMESHNYY, Y. A. N85-33377
KRIEG, R. D. N85-33714
KRINGLAURIDSEN, E. N85-33751
KRINSKY, S. N85-33761
KROEGER, D. M. N85-33253
KROEGER, R. N95-34022
KROMBEL, K. E. N85-34030
KRUTKOV, S. Y. N85-34101
KUBAN, D. P. N85-33526
KUDRYASHOV, Y. V. N85-33367
KUDRYAVTSEV, D. L. N85-33330
KULIKOV, G. V. N85-33975
KUNG, J. N85-33293
KUNKLE, T. D. N85-33434
KUNTE, P. K. N85-33966
N85-33979
KUPTSOV, Y. I. N85-33425
KURASAKI, S. S. N85-33527
KURDILA, A. J. N85-33747
KUREYCHIK, V. M. N85-33427
KURNOSOVA, L. V. N85-33981
KURT, V. G. N85-33137
KURTZ, S. R. N85-33259
KUSWA, G. W. N85-33306
KUZINA, A. M. N85-33159
KUZMIN, G. P. N85-33379
KUZMINOVA, Z. I. N85-33333
KVETNANSKY, R. N85-33681

L

LABELLE, S. N85-33842
LACKEY, W. J. N85-33252
LACKEY, W. J., JR. N85-33255
LACOMBE, J. F. N85-33197
LACY, J. L. N85-34007
N85-34104
LAFLEN, J. H. N85-33540
LAGUS, P. N85-33557
LAI, K. N85-33193
LAKE, M. S. N85-33181
LAMB, R. C. N85-33927
N85-33935
N85-33938
N85-33940
N85-33951
N85-33977
LAMBERT, A. N85-33923
N85-33971
LAMPE, M. N85-33812
LANCASTER, E. B. N85-33475
LANDAU, R. H. N85-33789
LANDER, G. H. N85-33770
LANG, K. R. N85-33897
LANGE, M. A. N85-33864
LANGE, R. D. N85-33693
LARKIN, E. N85-33693
LAROS, J. G. N85-33904
N85-33912
N85-33915
LARSEN, M. M. N85-33234
LARSON, D. C. N85-33808
LATHROP, L. W. N85-33612
LAU, K. H. N85-34033
LAU, M. M. N85-33967
N85-33983
LAU, Y. Y. N85-33812
LAUF, R. J. N85-33252
LAURSEN, S. N85-34033
LAVILLE, A. N85-34042
LAWRENCE, M. A. N85-34045
LAZARUS, D. N85-33788
LBRUN, F. N85-33994
LEA, C. N85-33308
LEACH, C. S. N85-33693
LEAHY, D. A. N85-33966
LEAKE, M. A. N85-33861
LEBEDINSKIY, S. A. N85-33372
LEBRON, J. E. N85-33113
LEBRUN, F. N85-33957
N85-33969
N85-33997
LECURU, D. N85-33510
LEE, F. C. N85-33294
LEE, M. L. N85-33221
LEE, R. N. N85-33620
LEE, Y. H. N85-33732
LEE, Y. W. N85-34075
LEE, Y. Y. N85-33788
LEEPER, R. J. N85-33306
LEFFLER, B. N85-33707
LEIDHEISER, H., JR. N85-33242
LEIMKUHLER, B. N85-33740
LERCHE, I. N85-34102
LETAW, J. R. N85-34005
LEVENTHAL, J. J. N85-33755
LEVENTHAL, M. N85-33962
LEVIN, Y. K. N85-33371
LEVITSKIY, V. G. N85-33346
LEWIS, M. N85-33800
LI, C. G. N85-33196
LI, G. N85-33944
LIANG, E. P. N85-33906
LIBBY, P. A. N85-33204
LICHT, H. H. N85-33272
LICHTENBERGER, A. N85-33223
N85-33224
LIDVANSKY, A. S. N85-33928
LIE, K. N85-33557
LIEBING, D. F. N85-33927
N85-33935
N85-33936
N85-33951
N85-33977
LIEBSCH, V. N85-33383
LIENESCH, J. H. N85-33626
LIEPINS, R. N85-33257
LIN, H. C. N85-33572
N85-33573
LINDBERG, J. P. N85-33169
LINDE, K. M. N85-33771
LINDQUIST, L. O. N85-33780
LINDSTROM, P. J. N85-34027
LING, J. C. N85-33917
N85-33954
N85-33956
N85-34002
LINGENFELTER, R. E. N85-33913
LINNEMANN, A. N85-33744
LINSLEY, J. N85-34046
N85-34081
N85-34082
LIPPMANN, M. J. N85-33587
LIPPS, F. W. N85-33579
LISCHENYUK, F. F. N85-34056
LITSOV, A. N. N85-33669
LITTLE, R. C. N85-33782
LIU, N. S. N85-33109
LLOYD-EVANS, J. N85-33923
N85-33971
N85-34051
N85-34073
LOEWENTHAL, S. H. N85-33520
LOGAN, J. G. N85-33703
LOH, E. C. N85-33933
N85-33966
N85-34044
N85-34049
N85-34071
LOKEN, M. C. N85-33771
LOKHMATYY, V. Y. N85-33362
LOMAN, V. I. N85-33386
LONGWELL, J. P. N85-33193
LORENZ, J. N85-33262
LOVKIY, V. K. N85-33353
LOWDERMILK, W. H. N85-33484
LOYD, R. J. N85-33830
LU, Z. N85-33944
LUBINA, M. N85-33375
LUBSANOVA, A. A. N85-33376
LUBYANAYA, N. D. N85-34101
LUDWIG, H. R. N85-33534
LUMLEY, J. L. N85-33206
LUNA, P. M. N85-33536
LUND, N. N85-34032
N85-34093
LUNINE, J. I. N85-33868
LUSK, E. L. N85-33706
LYAMTSEV, V. T. N85-33666
LYNCH, C. T. N85-33245
LYNCH, J. E. N85-33743
LYUBICH, F. D. N85-33411
LYULKIN, A. Y. N85-33408

M

MA, Y. N85-33944
MA, Y. E. N85-33293
MACALEER, B. N85-33841
MACARAEG, M. G. N85-33436
MACCALLUM, C. J. N85-33962
MACHO, L. N85-33681
MACKALL, D. A. N85-33119
MACKEOWN, P. K. N85-33938
N85-33951
N85-34066
N85-34075
MACLAINE-CROSS, I. N85-33590
MADARAS, S. N85-33710
MAGOTT, R. J. N85-33476
MAGUIRE, T. C. N85-33638
MAHIN, K. W. N85-33233
MAHONEY, W. A. N85-33917
N85-33954
N85-33956
N85-34002
MAKAROV, F. K. N85-33377
MAKAROV, I. T. N85-34055
MAKAROV, S. M. N85-33351
MAKDISI, Y. N85-33777
N85-33788
MAKEYEV, S. N. N85-33363
MAKSIMOV, Y. R. N85-33338
MALAKHOV, A. N. N85-33432
MALIK, S. N. N85-33540
MALIN, M. R. N85-33447
N85-33448
MALKUS, D. S. N85-33437
MALM, J. G. N85-33202
MALTSEVA, I. G. N85-33159
N85-33160
MAMBETALIYEV, B. S. N85-33665
MAMIDJANIAN, E. A. N85-33974
MANASEVIT, H. M. N85-33828
MANDELL, J. F. N85-33196
MANDROU, P. N85-33957
MANICKAM, J. N85-33814
MANNI, M. N85-33778
MANSON, S. T. N85-33755
MAO, N. H. N85-33461
MAPPER, D. N85-33833
MARAR, T. M. K. N85-33909
MARCINIAK, T. J. N85-33279
MARGOLIN, L. G. N85-33443
MARGOLIS, S. H. N85-34039
MARIGODOV, V. K. N85-33397
MARKIZOV, A. S. N85-33333
MARPLE, V. A. N85-33614
MARROQUIN, J. L. N85-33704
MARSHALL, I. R. N85-33801
MARSHALL, R. A. N85-33167
MARTIN, J. K. N85-33502
MARTIN, T. H. N85-33313
MARTINELLI, G. N85-33287
MARTINEZ, A. J. N85-33592
MARTINIC, N. N85-34069
MARTYNYUK, V. A. N85-33347
MASHCHENKO, A. G. N85-33366
MASHEDER, M. R. W. N85-34036
N85-34037
MASLENIKOV, O. R. N85-33724
MASSE, P. N85-34008
N85-34009
MASTRYUKOVA, V. M. N85-33686
MASURSKY, H. N85-33883
N85-33893
MATHIEU, J. N85-33222
MATSUBARA, Y. N85-33922
N85-34043
N85-34070
N85-34078
N85-34079
MATSUDA, Y. N85-33834
MATSUI, T. N85-33863
MATSUSHITA, S. N85-33845
MATTERN, L. J. N85-33276
MATTESON, J. L. N85-33903
N85-33963
N85-34000
MATTHEWS, G. N85-33657
MAUGER, B. G. N85-34104
MAY, V. I. N85-33421
MAYER-HASSELWANDER, H. A. N85-33929
N85-33950
N85-33991
N85-33994
N85-33997
MAYER, C. J. N85-33996
N85-33998
N85-33999
MAYER, H. G. N85-33508
MAZETS, E. P. N85-33905
MCBRIDE, S. E. N85-33708
MCCOMB, T. J. L. N85-33925
N85-33946
N85-33948
N85-33973
MCDANIEL, D. H. N85-33759
MCELROY, J. H. N85-33182
MCEVILY, A. J. N85-33231
MCGARRY, F. J. N85-33196
MCKINNIS, C. J. N85-33728
MCMILLAN, R. S. N85-33908
MCMULLIN, P. G. N85-33565
MCNEILLY, D. R. N85-33304
MCPHERRON, R. L. N85-33899
MEAD, D. W. N85-33193
MEDKOVA, I. L. N85-33674
MEEK, T. T. N85-33254
MEIER, D. L. N85-33568
MEIER, W. R. N85-33824
MELOSH, H. J. N85-33860
MERRIFIELD, R. M. N85-33700
MERRITT, D. A. N85-33647
MERZLYAKOV, N. S. N85-33326
MESECAR, R. S. N85-33295
N85-33709
METZGER, R. H. N85-33499
MEWALDT, R. A. N85-34023
MEYER, E. A. N85-33793
MEYER, P. N85-33451
N85-33769
N85-34022
MEYER, R. N85-33473
MIANE, J. L. N85-33197
MIDDLETON, D. B. N85-33116
MIHALKA, A. M. N85-33312
MIKAELYAN, A. N. N85-33380
MIKHAILOV, A. A. N85-34091
MIKHALCHAN, V. S. N85-33336
N85-33403
MIKHAYLOV-TEPLOV, N. N. N85-33333
MIKHAYLOV, V. V. N85-33364
MIKHAYLOVA, O. M. N85-33349
MIKULAS, M. M., JR. N85-33181
MIKUMO, E. N85-34061
MILLARD, G. C. N85-33607
N85-33612
MILLER, D. N85-34022
MILLER, G. F. N85-33752
MILLER, J. M. N85-33548
MILLER, W. J. N85-33250
MINCER, A. I. N85-34059
MIRANDA, P. N85-34069
MIRONOV, M. A. N85-33323
MIROSHNIKOVA, Y. B. N85-33678
MIROVITSKAYA, S. D. N85-33330
MITCHELL, A. C. N85-33896
MITO, I. N85-34061
MIYATA, S. N85-33188
MIZUMOTO, Y. N85-33933
N85-33968
N85-34044
N85-34049
N85-34071
MIZUTANI, K. N85-34061
N85-34065
MOATS, A. N85-34094
MODEL, A. M. N85-33385
MOLCHANOV, A. A. N85-33351
MOLS, G. E. N85-33309
MONTMERLE, T. N85-33958
N85-33961
MONTOLIVO, E. N85-33730
MOODY, N. R. N85-33498
MOORE, E. B. N85-33609
MOORE, J. N. N85-33636
MOORE, W. B. N85-33759
MORAN, K. P. N85-33647
MORELLO, C. N85-33937
N85-34073
MORGAN, G. D. N85-33817
MORI, M. N85-33922
N85-34043
N85-34078
N85-34079
MORKOC, H. N85-33296
MOROZOV, A. E. N85-33939
MORRA, F. N85-33559
MORRIS, J. W., JR. N85-33308
MORRIS, R. E. N85-33613
MORSE, E. C. N85-33824
MOSES, P. L. N85-33537
MOSES, R. T. N85-34036
N85-34037
MOSHNYAGA, V. G. N85-33343
MOSS, C. E. N85-33804
MOUGINIS-MARK, P. J. N85-33884
MOVCHAN, V. V. N85-33321
MRAZ, M. J. N85-33724
MSEZANE, A. Z. N85-33755
MUDFORD, N. R. N85-33211
MUELLER, D. N85-34105
MUKANOV, D. B. N85-33952
MULDER, S. J. N85-33113
MULLER, C. N85-33622
N85-33623
MULLER, K. E. N85-33694
MUNJAL, P. K. N85-33593
MURAKAMI, K. N85-34072
MURAKI, Y. N85-34052
N85-34053
MURAVEYSKAYA, A. A. N85-33369
MURAVYEV, S. I. N85-33392
N85-33395
MURPHY, A. P. N85-33194
MURPHY, B. L. N85-33466
MURPHY, R. M. N85-33574
MURRAY, W. N85-33711
MURUGOVA, T. P. N85-33678
MUSH, B. S. N85-33315
MYASNIKOV, V. I. N85-33670
MYERS, D. S. N85-33606
MYERS, R. M. N85-33943
MYRABO, L. N. N85-33186

N

NAGANO, M. N85-33922
N85-34043
N85-34070
NAGATA, K. N85-34035
NAGY, Z. N85-33216
NAKAMURA, T. N85-33830
NAKAWAMA, M. N85-33199
NARANAN, S. N85-33966
N85-33979
NASH, W. F. N85-33921
N85-34050
NAVARRA, G. N85-33928
N85-33937
NAVATHE, S. B. N85-33737
NAYAK, A. P. N85-33179
N85-33180
NAZARENKO, L. S. N85-33421
NAZAROV, V. I. N85-33372
NAZAROV, V. L. N85-33975
NELLIS, W. J. N85-33896
NELSON, D. O. N85-33723
NELSON, N. J. N85-33721
NELSON, R. M. N85-33871
NEWMAN, G. H. N85-33501
NEWNAM, B. E. N85-33481
NEWPORT, B. J. N85-34038
NEZLIN, D. V. N85-33319
NG, L. K. N85-34075
N85-34107
NGHIEM, H. N85-33293
NICHOLSON, M. M. N85-33299
NICKOLS, R. C. N85-33577
NICKS, O. W. N85-33126
NIEL, M. N85-33912
N85-33915
NIEVERGELT, J. N85-33734
NIKOLAYEV, V. A. N85-33162
NIKOLSKAJA, N. M. N85-33939
NIKOLSKY, S. I. N85-33939
N85-33974
NIKULINA, G. A. N85-33142
NISHIJIMA, K. N85-33922
N85-34070
N85-34078
N85-34079
NISHIKAWA, T. N85-33188
NISHIMURA, J. N85-33918
NITABARU, M. N85-33511
NIZHEGORODOV, S. P. N85-33333
NOCHUMSON, D. H. N85-33592
NORENKOV, I. P. N85-33345
N85-33347
NORKINA, T. Y. N85-33682
NOSIKOV, S. P. N85-33355
NOVIKOVA, N. D. N85-33683
NOVOSELOV, V. G. N85-33409
NOWICK, A. S. N85-33580
NUZHNOV, Y. V. N85-33427
NYGREN, W. D. N85-33522

O

OAKES, W. R. N85-33707
OBARA, T. N85-34069
OBLOW, E. M. N85-33503
OBRYADCHIKOV, O. S. N85-33151
OEZEL, M. E. N85-33929
N85-33965
OHOKA, H. N85-34043
OHTA, I. N85-34016
OKA, A. N85-33199
OKABAYASHI, M. N85-33814
OKEEFFE, T. W. N85-33568
OLDENBORG, R. C. N85-33219
OLINS, D. E. N85-33697
OLSON, E. S. N85-33215
ONODA, J. N85-33528
ORESHNIKOV, V. G. N85-33360
ORFORD, K. J. N85-33925
N85-33946
N85-33948
N85-33973
ORLANDI, G. N85-33287
ORMES, J. F. N85-34017
N85-34018
OROURKE, P. J. N85-33722
OSBORNE, D. N85-33518
OSTERWALD, C. R. N85-33599
OTAGAWA, T. N85-33464
OVERBEEK, R. A. N85-33706
OVSYANNIKOV, N. N85-33414
OWEN, L. W. N85-33816
OWENS, A. N85-33943
OWYOUNG, A. N85-33218
OZIMA, M. N85-33852
OZROKOV, S. S. N85-33928

P

PACKARD, D. T. N85-33513
PAIGE, D. A. N85-33866
PALASCHAK, P. A. N85-33565
PALSHKOV, V. V. N85-33401
PANDEY, P. K. K. N85-33626
PANFEROVA, N. Y. N85-33675
N85-33678
PANKRATZ, L. B. N85-33560
PANONTIN, T. L. N85-33535
PANOV, V. N85-33390
PAPELL, S. S. N85-33433
PARK, C. N85-33177
PARKER, J. R. N85-33292
PARKINSON, W. H. N85-33624
PARNELL, T. A. N85-34012
PARYGIN, V. N. N85-33431
PASTUKHOVA, I. N. N85-33376
PATTAVINA, A. N85-33286
PATTERSON, J. H. N85-33781
PATTERSON, J. R. N85-34048
N85-34077
PAUL, J. N85-33957
N85-33989
PAULUS, G. N85-33731
N85-33741
PAVLOV, V. N. N85-33429
N85-34054
N85-34057
PAVLOVA, T. G. N85-33408
PAWLOSKI, G. A. N85-33301
PAYNE, R. C. N85-33752
PEASLEE, A. T. N85-33592
PELLI, R. N85-33507
PENLAND, J. A. N85-33107
PENNEMAN, R. A. N85-33202
PENNEY, T. R. N85-33590
PEPIN, R. O. N85-33853
PEREZ-PERAZA, J. N85-34042
PEREZ, R. N85-33492
PERIALE, L. N85-33937
PERKINS, G. S. N85-33526
PERKINS, R. W. N85-33766
PERKINS, S. T. N85-33768
PERRETT, J. C. N85-33923
N85-33971
N85-34045
PERRON, C. N85-34041
PESAMOSCA, G. N85-33746
PESTRYAKOV, A. V. N85-33417
PETERS, R. D. N85-33610
PETERS, W. A. N85-33193
PETERSON, E. N85-33557
PETERSON, U. K. N85-33155
PETROSYANTS, K. O. N85-33349
PETROU, N. N85-34031
PETROV, G. V. N85-33423
PETROV, S. Y. N85-33151
PHILLIPS, A. R. N85-33725
PIEKARSKI, C. N85-33698
PIERCE, J. L. N85-33708
PIETRZYK, Z. A. N85-33821
PINKERTON, A. L. N85-33440
PISCITELLA, R. R. N85-33439
PITRE, E. M. N85-33772
PITTMAN, J. L. N85-33107
PITTS, J. R. N85-33305
N85-33495
PIZZICHINI, G. N85-33914
PLAKHUTA-PLAKUTINA, G. I. N85-33680
PLOKHENKO, Y. V. N85-33148
PLUMMER, E. W. N85-33228
PODOSEK, F. A. N85-33852
POKHVALINA, L. S. N85-33354
POKROVSKIY, A. N85-33129
N85-33131
POKROVSKIY, Y. A. N85-33420
POLESHCHUK, A. T. N85-33677
POLIKARPOV, S. N. N85-33316
POLL, J. D. N85-33806
POLLOCK, A. M. T. N85-33929
N85-33950
N85-33964
N85-33997
POLOVINKIN, A. V. N85-33432
POLYAKOV, P. F. N85-33358
POLYAKOVA, A. P. N85-33141
POLYANSKIY, A. F. N85-33146
PONDER, G. N85-33434
PONOMAREV, L. I. N85-33388
PONOMAREV, V. A. N85-33396
N85-33400
PONOMAREVA, O. V. N85-33396
N85-33400
POPENKO, N. A. N85-33412
POPKOV, Y. P. N85-33412
POPOV, S. N85-33390
POPOVA, L. N85-34064
PORTER, N. A. N85-33927
N85-33935
N85-33938
N85-33951
N85-33977
PORTER, R. S. N85-33529
POSHKUS, A. C. N85-33187
POTTER, J. M. N85-33309
POWERS, B. G. N85-33124
PRAH, J. D. N85-33694
PRANTZOS, N. N85-33936
N85-34003
PRAVDIN, M. I. N85-34055
N85-34058
PRESCOTT, J. R. N85-34067
N85-34077
PRESES, J. M. N85-33755
PRICE, M. K. N85-33194
PRICE, P. B. N85-34040
PRIESETT, K. N85-33516
PRILUTSKY, O. F. N85-33911
PROKSCH, E. N85-33615
PROTHEROE, R. J. N85-33972
N85-33986
N85-34048
N85-34076
N85-34077
PTUSKIN, V. S. N85-33988
PUGOVKIN, A. V. N85-33430
PURCELL, J. R. N85-33830
PUTLAND, F. H. N85-33229
PYLE, R. V. N85-33764

Q

QAZI, R. A. N85-33949
QIN, H. Q. N85-33449

R

RADIKAYNEN, Y. M. N85-33337
RADOUSKY, H. B. N85-33896
RAI-CHOUDHURY, P. N85-33568
RAITALA, J. N85-33885
RAJAN, N. N85-33745
RAJEEV, M. R. N85-33919
RAMANAMURTHY, P. V. N85-33919
N85-33941
N85-33942
N85-33947
N85-33953
N85-33976
RAMATY, R. N85-34095
RAMM, N. S. N85-33159
RANA, N. C. N85-33932
RANNOT, R. C. N85-33926
N85-33949
RAO, A. S. P. N85-33859
RAO, M. V. S. N85-33919
N85-34066
RAO, U. R. N85-33909
RASMUSSEN, D. A. N85-33825
RASMUSSEN, I. L. N85-34033
RATHBUN, L. A. N85-33469
RATIGAN, J. L. N85-33771
RATNER, L. G. N85-33788
RAVEX, A. N85-33277
RAWAT, H. S. N85-33926
N85-33949
RAYKHLIN, A. K. N85-33339
RAZDAN, H. N85-33926
N85-33949
REAGOR, F. N85-33710
REGAN, D. J. N85-33936
REGNAULT, W. F. N85-33572
N85-33573
REID, D. W. N85-33309
REID, R. J. O. N85-33923
N85-34045
N85-34073
REILHAN, S. N85-33473
REIMAN, A. N85-33815
REMICK, R. J. N85-33586
RENSCHLER, C. L. N85-33767
REPENKOVA, L. G. N85-33687
REUTER, H. A. N85-33493
REUTERSWAERD, C. N85-33278
REYNES, A. N85-33222
RHODES, M. D. N85-33181
RICHARDS, M. A. N85-33888
RICHARDS, R. K. N85-33825
RICHARDSON, D. D. N85-33167
RICHARDSON, G. N85-33440
RICHMOND, A. D. N85-33845
RICKS, R. E. N85-33503
RIECK, H. G. N85-33766
RIEGER, E. N85-33955
N85-34001
RIEPE, K. B. N85-33793
RIGGIN, R. M. N85-33620
ROBBEN, F. A. N85-33268
ROBERSON, P. L. N85-33469
ROBERTS, A. M. N85-33708
ROBERTSON, G. D. N85-33827
ROBERTSON, L. M. N85-33307
ROBERTSON, M. M. N85-33470
ROCCHIA, R. N85-34109
RODIONOV, I. M. N85-33662
RODIONOV, V. V. N85-33324
RODRIQUE, G. N85-33739
ROGALSKIY, V. I. N85-33327
ROGER, N. N85-33519
ROGNLIEN, T. D. N85-33834
ROHATGI, A. N85-33565
N85-33568
ROHN, D. A. N85-33520
ROMANOV, A. N. N85-33687
ROMANOV, V. A. N85-34101
ROQUES, J. P. N85-33957
ROSE, K. N85-33621
ROSEMEIER, R. C. N85-33572
ROSEMEIER, R. G. N85-33573
ROSEN, S. P. N85-33756
ROSENBERG, I. J. N85-33769
ROSENFELD, J. L. N85-33634
ROSS, M. N85-33896
ROSS, M. N. N85-33873
ROSS, Y. K. N85-33155
ROTENBERG, M. N85-34093
ROTHSCHILD, R. E. N85-33963
ROWNTREE, R. A. N85-33521
ROY, D. M. N85-33263
ROY, R. H. N85-33111
ROZANOV, L. N. N85-33161
RUBOW, K. L. N85-33614
RUBY, L. N85-33764
RUDAZ, S. N85-34100
RUMYANTSEV, V. P. N85-33390
RUNCORN, S. K. N85-33887
N85-33894
RUPPEL, H. M. N85-33443
RUSANOV, B. V. N85-33373
RUSCIC, B. M. N85-33478
RUSK, S. J. N85-33517
RUSSELL, L. M. N85-33435
RUSSELL, R. J. N85-33467
RUTKOWSKI, H. L. N85-33793
RUZAYEV, Y. N. N85-33357

RYABTSOV, A. L. N85-33361
RYNASKI, E. G. N85-33125
RYZHOV, B. N. N85-33670

S

SABERI, H. A. N85-33111
SABIROV, Z. A. N85-33404
SACCO, B. N85-33950
SADZINSKA, M. N85-33932
SAFONKIN, A. F. N85-33692
SAGAR, B. N85-33556
SAIC, S. N85-33809
SAICH, M. R. N85-33921
SAICH, M. S. N85-34050
SAICHEV, A. I. N85-33432
SAJONARA, F. X. N85-33284
SALAMON, M. H. N85-34040
N85-34044
N85-34071
SALERNO, J. N85-33457
SALERNO, M. N85-33287
SALIVON, V. N. N85-33393
SALNITSKIY, V. P. N85-33670
SAMIRANT, M. N85-33223
N85-33224
N85-33225
SANDER, O. R. N85-33758
SANDERSON, T. K. N85-33833
SANECHA, V. K. N85-33926
N85-33949
SANTORO, R. T. N85-33776
SAPRU, M. I. N85-33949
SAPRU, M. L. N85-33926
SARRAFIAN, S. K. N85-33124
SASSER, D. W. N85-33712
SATO, K. N85-34061
SATO, T. N85-34065
SATO, Y. N85-33511
N85-34016
SAUNDERS, M. A. N85-33711
SAVILOV, A. A. N85-33140
SAVINA, Y. A. N85-33680
SAVKOV, N. N. N85-33341
SCHAAD, G. N85-33698
SCHAEFER, B. E. N85-33910
SCHEFER, R. W. N85-33209
SCHEIBER, R. N85-33550
SCHIDLOWSKI, M. N85-33867
SCHIMMERLING, W. N85-34027
SCHINDLER, S. M. N85-34033
SCHLACHTER, A. S. N85-33764
SCHLICKEISER, R. N85-33965
N85-34102
SCHMITT, H. N85-33108
SCHMITT, P. N85-33754
SCHNEIDER, J. D. N85-33719
SCHNEIDER, J. P. N85-33473
SCHNEIDER, S. R. N85-33182
SCHOENFELDER, V. N85-33980
SCHRIER, D. A. N85-34011
N85-34029
SCHUBERT, G. N85-33873
SCHULTZE, W. A. N85-33240
SCHWARTZ, R. A. N85-33917
SCHWEITZER, D. G. N85-33765
SCOTT, P. A. N85-33610
SCOTTI, J. V. N85-33908
SEAMON, R. E. N85-33782
SECHRIST, C. F., JR. N85-33625
SEEMAN, J. T. N85-33783
SEETHA, S. N85-33909
SEILER, F. N85-33452
SEKIGAWA, K. N85-33199
SELBY, J. M. N85-33466
SEMKIN, A. A. N85-33341
SENCHENKO, V. V. N85-33421
SEPHTON, A. J. N85-34050
SEREDA, P. J. N85-33241
SEROVA, L. V. N85-33679
SETCHELL, R. E. N85-33270
SEYFERT, M. P. N85-33277
SHABASHEV, O. K. N85-33369
SHABELNIKOV, V. G. N85-33677
SHAFFER, I. S. N85-33245
SHAKHGILDYAN, V. V. N85-33417
SHAMROTH, S. J. N85-33105
N85-33109
SHANAYEV, O. K. N85-33335
SHAPOSHNIKOV, A. S. N85-33360
SHARE, G. H. N85-33955
N85-34001
SHAREYKO, L. A. N85-33406
SHATALOV, F. A. N85-33331
SHATOKHIN, V. M. N85-33364
SHAW, J. H. N85-33637
SHCHEVYAKOV, Y. N85-33147
SHEFFER, Y. K. N85-33137
SHEROW, J. D. N85-33217
SHESTOPALOV, V. P. N85-33412
SHEVCHENKO, V. F. N85-33669
SHEVYAKOV, M. M. N85-33429
SHI, G. N85-33628
SHILOV, V. M. N85-33682
SHIMADA, E. N85-34016
SHIN, K. G. N85-33732
SHINKAREVA, M. M. N85-33682
SHIPMAN, G. R. N85-33638
SHIRINYAN, E. A. N85-33689
SHIROKOV, B. N85-33416
SHKARINOV, Y. S. N85-33385
SHLOMA, A. M. N85-33325
SHMIGOL, A. T. N85-33363
SHORT, W. N85-33562
SHPER, V. I. N85-33365
SHTRYKOV, V. K. N85-33327
SHULAKOVA, M. S. N85-34101
SHULGIN, G. N85-33389
SHULTHEIS, C. F. N85-33281
SHULZHENKO, Y. B. N85-33140
SHUMILOVA, E. D. N85-33364
SHURTER, R. P. N85-33793
SHVETS, V. N. N85-33680
SIDHU, S. N85-33788
SIEBER, W. N85-33965
SIEBERT, C. J. N85-33530
SIGAYEV, V. V. N85-33687
SILAEV, A. A. N85-33975
SILBERBERG, R. N85-34005
SILES, L. N85-34069
SIL!.WOOD, J. M. N85-33195
SILVERSTEIN, L. D. N85-33700
SIMKIN, A. V. N85-33320
SIMPSON, J. A. N85-34026
SINGH, R. N85-33571
SINHA, S. N85-33919
SIVAPRASAD, K. N85-34060
N85-34066
SJOEGREN, P. N85-33750
SKELLY, J. N85-33788
SKELTON, R. N85-33778
SKINNER, N. N85-33237
SKLAREW, D. S. N85-33635
SKLYAROV, V. V. N85-33928
SKODA, K. N85-33375
SKOTHEIM, T. N85-33258
SKURIN, L. I. N85-33146
SLAGA, T. J. N85-33655
SLAVIN, J. A. N85-33875
SLEPTSOV, I. Y. N85-34054
N85-34056
N85-34057
SMIGIELSKI, P. N85-33472
N85-33473
N85-33474
SMIRNOV, M. V. N85-33161
SMIRNOV, Y. V. N85-33981
SMITH, C. J. E. N85-33244
SMITH, E. J. N85-33875
SMITH, G. R. N85-33797
SMITH, J. R. N85-33268
SMITH, L. H. N85-33655
SMITH, S. A. N85-33596
SMOAK, W. G. N85-33265
SMORGONSKIY, V. Y. N85-33422
SMYTH, W. H. N85-33848
SNAPP, L. N85-33477
SNELL, G. J. N85-33453
SNYDER, F. B. N85-33115
SNYDER, F. L. N85-33656
SOBOLEV, Y. V. N85-33358
SOGABE, T. N85-33230
SOKOLOV, V. I. N85-33676
SOKOLOV, V. N. N85-33426
SOKOLSKY, P. N85-33933
N85-33968
N85-34049
SOLODOVNIK, F. A. N85-33672
SOLOMON, J. A. N85-33695
SOLOVYEVA, V. I. N85-33975
SOMMERS, P. N85-33933
N85-33968
N85-34086
SOMOV, P. A. N85-33345
SOUERS, P. C. N85-33806
SOUTOUL, A. N85-34008
N85-34009
N85-34031
SPALDING, D. B. N85-33447
SPALVINS, T. N85-33524
SPAMPINATO, P. T. N85-33820
SPETZLER, H. N85-33878
SPICER, C. W. N85-33620
SPOHN, T. N85-33874
N85-33881
SREEKANLAN, B. V. N85-33966
SREEKANTAN, B. V. N85-33919
N85-33941
N85-33947
N85-33970
N85-34066
SREENIVASAIAH, K. V. N85-33909
STAELIN, D. H. N85-33846
STAMENOV, J. N. N85-33939
N85-33978
N85-34062
STANEV, T. N85-33930
STANLEY, G. B. N85-33921
STARNES, J. H. N85-33546
STATTEL, P. N85-33778
STAZHADZE, L. L. N85-33687
STEARNS, J. W. N85-33764
STECK, D. N85-33933
N85-33968
STECK, O. N85-34049
STECKER, F. W. N85-33992
N85-34099
N85-34100
STEFFES, P. G. N85-33847
STEINETZ, B. M. N85-33520
STEINKRUGER, F. J. N85-33781
STEINMAYER, R. F. N85-33246
STENGER, V. J. N85-33927
N85-33935
N85-33938
N85-33951
N85-33977
STEPANOV, B. N85-33389
STEPANOV, S. V. N85-34101
STEPANOVA, I. P. N85-33373
STEPANYANTS, E. A. N85-33377
STEPASHKIN, A. I. N85-33392
N85-33395
STEPHEN, J. H. N85-33833
STEPHENS, S. A. N85-33959
N85-33960
N85-34007
N85-34024
N85-34092
N85-34098
N85-34104
N85-34108
STETTER, J. R. N85-33464
STEVENSON, D. J. N85-33862
STEWART, J. J. N85-33834
STIMPFLING, A. N85-33473
N85-33474
STINECIPHER, M. M. N85-33269
STINNETT, R. W. N85-33759
STINTON, D. P. N85-33252
STIX, T. H. N85-33614
STOCKTON, J. R. N85-33290
STOFEL, E. J. N85-33570
STONE, C. M. N85-33714
STONE, E. C. N85-34014
N85-34033
N85-34038
N85-34039
STORTI, G. M. N85-33572
STRAUCH, R. G. N85-33647
STRAWN, N. N85-33585
STREITMATTER, R. E. N85-34017
N85-34018
STRETZ, L. A. N85-33269
STRONG, A. W. N85-33929
N85-33991
N85-33994
N85-33995
STROUP, C. A. N85-33592
STRUCHKOV, G. G. N85-34054
STRZHIZHOVSKIY, A. D. N85-33686
STUVE, J. M. N85-33560
STUZHIN, V. A. N85-33385
SU, S. Y. W. N85-33737
SUBRAMANIAN, R. S. N85-33248
SUGA, K. N85-34069
SUGIMOTO, H. N85-34016
SUKAMAR, S. N85-34103
SULLENBERGER, M. N85-33720
SULLIVAN, T. J. N85-33603
SUMMITT, R. N85-33239
N85-33247
SUN, L. N85-34074
SUNWOO, A. J. N85-33233
SUSOEFF, A. R. N85-33501
SUTKOVOY, D. A. N85-33663
SUURA, H. N85-33798

SUZUKI, S. N85-33230
SVYATOGOR, V. V. N85-33383
SWAIN, D. W. N85-33825
SWAMINATHAN, S. N85-33953
N85-33976
SWANSON, B. I. N85-33220
SWEENEY, W. N85-33945
SWIMM, R. T. N85-33201
SWINTH, K. L. N85-33469
SYMONS, P. C. N85-33588
SYMONS, T. J. M. N85-34027

T

TAIRA, K. N85-34016
TAKAHASHI, T. N85-34065
TAN, L. C. N85-34025
N85-34090
N85-34097
N85-34106
TANAHASHI, G. N85-34070
TANAKA, S. N85-34016
TANG, J. N85-34105
TANKOVSKI, N. S. N85-33431
TARASENKO, V. F. N85-33379
TARLE, G. N85-34040
TASAKA, S. N85-34016
TASHK, D. N85-33705
TASK, H. L. N85-33810
TATARNIKOV, V. G. N85-33405
TATEYAMA, N. N85-34016
TAVASSOLI, M. N85-33693
TAYLOR, R. D. N85-33813
TAYLOR, S. R. N85-33879
TAZETDINOV, I. G. N85-33142
TEEGARDEN, B. J. N85-33936
TELOT, K. N85-33351
TEMCHENKO, V. S. N85-33326
TENNANT, R. A. N85-33719
N85-33791
TERENTYEV, V. M. N85-33359
TERPUGOV, N. V. N85-33334
TESCHE, T. W. N85-33613
TESHIMA, M. N85-34043
N85-34078
TESKE, D. R. N85-33531
TEVAARWERK, J. L. N85-33491
THACKER, L. H. N85-33304
THADDEUS, F. N85-33994
THOMAS, T. M. N85-33495
THOMPSON, D. J. N85-33607
THOMPSON, J. B., JR. N85-33634
THOMPSON, M. G. N85-33943
TICKOO, A. K. N85-33949
TIGRANYAN, R. A. N85-33681
TIHEKARI, H. N85-33551
TIKHOBAYEVA, O. I. N85-33691
TIKHOMIROVA, Y. M. N85-33343
TILDEN, B. M. N85-33836
TILIS, A. Y. N85-33664
TINGEY, G. I. N85-33803
TINGEY, G. L. N85-33796
TIONG, L. W. N85-33724
TITOV, A. A. N85-33687
TIZENGAUZEN, V. A. N85-33928
TKACZYK, W. N85-33907
N85-33978
N85-33984
N85-34085
TOERROENDEN, K. N85-33507
TOKAREV, S. B. N85-33376
TOMES, V. N85-33809
TONWAR, S. C. N85-33919
N85-33949
N85-33970
N85-34059
N85-34060
TOOR, P. M. N85-33728
TORRES, F. J. N85-33435
TORRES, L. N85-33222
TORREY, M. D. N85-33446
TOVMASYAN, G. N85-33133
TRACY, C. E. N85-33273
N85-33302
TRAN-CONG, T. N85-33112
TRANKOV, S. N. N85-33362
TRASK, N. J. N85-33634
TRAUB, R. J. N85-33466
TRAVIS, B. J. N85-33434
TRIFONOV, I. I. N85-33393
TRIGILA, S. N85-33286
TRINH, T. Q. N85-33293
TRIPLETT, L. L. N85-33655
TRITTEN, P. N85-33264
TROFIMOV, V. P. N85-33425
TROKHIMENKO, Y. K. N85-33348
N85-33353
N85-33411
TRUBITSYN, A. V. N85-33975
TRUCANO, T. G. N85-33445
TRUDONOSHIN, V. A. N85-33347
TRUJILLO, F. N85-33300
TRUSOV, N. B. N85-33370
TSAO, C. H. N85-34005
TSUGAWA, R. T. N85-33808
TUBACH, J. P. N85-33285
TUCKER, W. K. N85-33275
TUEFEKCIOGLU, A. N85-33243
TUELLER, J. N85-33936
TUEMER, O. T. N85-33940
TUEMER, T. N85-33945
TUKISH, E. I. N85-33974
TULENKO, D. M. N85-33217
TURCHANINOVA, I. V. N85-33141
TURGUNBAYEV, M. D. N85-33666
TURNER, J. E. N85-33822
TURVER, K. E. N85-33925
N85-33946
N85-33948
N85-33973
TWIGG, L. T. N85-33181
TYNDALL, R. L. N85-33695

U

UCKAN, N. A. N85-33819
UCKAN, T. N85-33819
N85-33825
UMBARGER, C. J. N85-33300
USHAKOV, A. S. N85-33678
USHEV, S. Z. N85-33939
USIKOV, D. A. N85-33149
USKOV, V. L. N85-33356
USPENSKIY, A. B. N85-33148

V

VAFIN, R. F. N85-33153
VAKULOV, P. V. N85-34020
VALLANIA, P. N85-33937
VALLARIO, B. J. N85-33466
VALLOTTON, W. C. N85-33527
VALUYEV, K. K. N85-33422
VANDEHULST, H. C. N85-33872
VANDERBIJ, J. J. N85-33763
VANDERMEE, C. V. M. N85-33872
VANDEVENDER, J. P. N85-33725
VANGULICK, I. A. N85-33549
VANHAAFTEN, F. W. N85-33793
VANSTONE, R. H. N85-33540
VANTILBURG, J. J. N85-33843
VANTKE, K. D. N85-33383
VARMA, M. N. N85-33657
VASILYEV, G. I. N85-34101
VASILYEV, Y. Y. N85-34020
VASYUTINSKIY, S. B. N85-33373
VAUGHAN, D. R. N85-33309
VDOVIKO, V. P. N85-33364
VEDRENNE, G. N85-33912
N85-33915
VELMRE, E. E. N85-33350
VENKATESAN, D. N85-33966
N85-33979
VERIGA, B. A. N85-33387
VERNOV, S. N. N85-34020
VERTIY, A. A. N85-33412
VEST, R. W. N85-33569
VESTRAND, W. T. N85-33934
VEYS, V. N. N85-33413
VIKTOROV, A. N. N85-33683
VIKTOTOV, A. N. N85-33682
VILESOV, L. D. N85-33413
VILLARD, O. G. N85-33627
VILPAS, M. N85-33551
VISHWANATH, P. R. N85-33919
N85-33941
N85-33942
N85-33947
N85-33953
N85-33976
VIT, I. N85-33383
VITYAZEV, V. V. N85-33392
N85-33395
VLASES, G. C. N85-33821
VLASOVA, T. F. N85-33678
VLASYUK, Y. S. N85-33340
VOGES, W. N85-34112
VOLESKIY, E. N85-33375
VOLKOV, M. Y. N85-33677
VOLOSHINOV, V. B. N85-33431
VOLOZHIN, A. I. N85-33143
VOLYNSKIY, M. B. N85-33409
VORONIN, Y. N. N85-33326
VOYTENKO, G. N85-33415
VOZNAYA, G. N85-33415
VYAKHIREV, N. I. N85-33387

W

WACKER, J. F. N85-33850
WADDINGTON, C. J. N85-34014
N85-34038
N85-34039
WAECHTER, D. A. N85-33300
WAGNER, J. N85-33709
WAGNER, J. W. N85-33753
WAGNER, R. A. N85-33771
WAHDAN, A. N85-33993
WALKER, R. A. N85-33111
WALKER, R. N. F. N85-34036
N85-34037
WALLDEN, R. N85-33288
WALLIN, K. N85-33551
WALSH, T. N85-34100
WALSH, W. J. N85-33588
WANDEL, A. N85-34080
WANG, C. D. N85-33573
WANG, T. F. N85-33794
WANISH, D. N85-33842
WARD, S. H. N85-33636
WARREN, P. H. N85-33882
N85-33895
WASSON, J. T. N85-33851
WATSON, A. A. N85-33923
N85-33971
N85-34045
N85-34073
WATSON, J. J. N85-33181
WATTS, H. A. N85-33726
WATTS, J. W. N85-34012
WATTS, R. L. N85-33596
WDOWCZYK, J. N85-33932
N85-33969
N85-34064
N85-34083
N85-34088
WEAVER, H. T. N85-34111
WEBBER, W. R. N85-34008
N85-34009
N85-34011
N85-34024
N85-34029
WEBER, J. L. N85-33264
WEDUM, E. E. N85-33237
WEEKES, T. C. N85-33927
N85-33935
N85-33938
N85-33951
WEELES, T. C. N85-33977
WEFEL, J. P. N85-34026
N85-34027
WEGNER, V. N85-33178
WEIDENSCHILLING, S. J. N85-33857
N85-33861
WEISBIN, C. R. N85-33503
WEISCHEDEL, H. R. N85-33509
WEISSMAN, J. C. N85-33658
WENDER, S. A. N85-33775
WEST, A. A. N85-33923
N85-33971
WEYHMANN, W. N85-33236
WHEATON, W. A. N85-33917
N85-33940
N85-33954
N85-33956
N85-34002
WHITE, J. A. N85-33563
WHITE, R. S. N85-33945
WHITE, T. L. N85-33825
WHITEMAN, C. D. N85-33808
WHITTEN, G. Z. N85-33618
N85-33619
WIEDENBECK, M. E. N85-34028
N85-34030
WILL, D. I. N85-33274
WILLEMANN, R. J. N85-33886
WILLIAMS, D. R. N85-33889
WILLIAMS, G. C. N85-33193
WILLIAMS, R. J. N85-33927
WILLIAMS, T. A. N85-33597
WILLIAMSON, F. S. N85-33801
WILLIAMSON, K. D., JR. N85-33592
WILSON, S. K. N85-33440
WINDHOFER, P. N85-33762

WINIECKI, A. L. N85-33459
WINKLER, C. M. N85-33707
WINN, K. E. N85-33219
WISE, J. L. N85-33445
WITKOVER, R. N85-33777
WITSCHI, H. P. N85-33655
WITT, A. N85-33550
WITZE, P. O. N85-33502
WOGMAN, N. A. N85-33766
WOLF, M. A. N85-33300
WOLFE, J. P. N85-33470
WOLFENDALE, A. W. N85-33932
N85-33996
N85-33998
N85-33999
N85-34088
N85-34099
WONG, C. M. N85-34107
WOOD, C. N85-33260
WOOD, C. M. N85-33476
WOODBURY, M. H. N85-33732
WORLEY, A. N85-34036
N85-34037
WRIGHT, A. S., JR. N85-33181
WRIGHT, H. A. N85-33822
WRIGHT, M. H. N85-33711
WU, M. N85-33944
WURBS, R. A. N85-33553

X

XU, C. N85-33944
N85-34089

Y

YADAV, J. S. N85-34010
YAKENAKA, T. N85-34035
YAKOVLEV, O. I. N85-33327
YAKOVLEV, V. I. N85-33939
YAKOVLEVA, V. I. N85-33680
N85-33688
YAMAGAMI, T. N85-33918
YANAGIMACHI, T. N85-34035
YARLYKOV, M. S. N85-33323
YAROSLAVSKIY, L. P. N85-33326
YASTREBOV, N. I. N85-33353
YATSKIV, Y. S. N85-33138
YAU, J. F. N85-33540
YEFIMOV, A. I. N85-33327
YEFREMOVA, O. N. N85-33163
YEGOROV, A. D. N85-33141
N85-33668
YEGOROVA, V. P. N85-34057
YEMIN, V. I. N85-33329
YEROSHCHENKOV, Y. K. N85-33367
YESICHEV, A. B. N85-33367
YEVDOKIMOV, V. I. N85-33671
YODH, G. B. N85-34059
N85-34060
YOO, K. C. N85-33573
YOROZU, M. N85-33230
YOSHII, H. N85-34069
YOSHIZAKI, S. N85-33199
YOUNG, D. A. N85-33896
YOUNG, E. C. M. N85-33967
N85-33983
YOUNG, R. H. N85-33802
YU, Z. Z. N85-33800
YUCEL, S. N85-33800
YUDA, T. N85-34061
YUGANOV, Y. M. N85-33668
YUROV, V. N. N85-33981
YUROV, Y. Y. N85-33419
YUROVA, K. S. N85-33677

Z

ZADAROSHNAYA, G. N. N85-33376
ZAJAC, R. S. N85-33499
ZAK, B. D. N85-33648
ZAKHAROV, A. A. N85-33398
ZALOGUYEV, S. N. N85-33682
ZAROMB, S. N85-33464
ZAROSLOV, D. Y. N85-33379
ZARUBINA, K. V. N85-33682
ZATSEPIN, V. I. N85-34020
ZAVADOVSKIY, A. F. N85-33675
ZAVYALOV, M. A. N85-33367
ZELENKO, G. N85-33390
ZEMANN, H. N85-33550
ZHANG, C. N85-33944
ZHANG, X. N85-33944
ZHAO, J. X. N85-33636
ZHIZNEVSKAYA, O. V. N85-33674
ZHURAKOVSKIY, V. N. N85-33335
ZHURAVLEV, D. A. N85-34020
ZINATOV, K. G. N85-33153
ZIPSE, J. E. N85-34007
N85-34104
ZOPFF, D. N85-33453
ZVENIGORODSKAYA, A. N. N85-33370
ZYCH, A. D. N85-33945
ZYSKIN, Y. L. N85-33952

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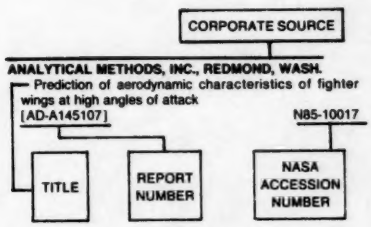
Typical Corporate Source Index Listing



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A

ACADEMIA SINICA, BEIJING (CHINA).
Observation of hard X-rays from the Crab pulsar and A0535+26
[OG-2.3-7] N85-33944
A model for the proton spectrum and cosmic ray anisotropy
[OG-5.4-12] N85-34089

ACADEMY OF SCIENCES OF THE ARMENIAN SSR, EREVAN (USSR).
Primary gamma-rays with E gamma or = to 10(15) eV: Evidence for ultrahigh energy particle acceleration in galactic sources
[OG-2.6-13] N85-33974
Ultrahigh energy gamma rays: Carriers of cosmological information
[OG-2.7-14] N85-33987

ACADEMY OF SCIENCES (USSR), LENINGRAD.
Annihilation radiation in cosmic gamma-ray bursts
[OG-1.1-3] N85-33905
Galactic antiprotons of 0.2-2 GeV energy
[OG-6.1-11] N85-34101

ACADEMY OF SCIENCES (USSR), MOSCOW.
The magnetic field of planets N85-33891
What we have learned about the magnetic field of Mars N85-33892
Neutrino-antineutrino annihilation around collapsing star
[OG-1.1-10] N85-33911
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network
[OG-1.2-1] N85-33912
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
On gamma and neutrino radiation from Cyg X-3
[OG-2.1-7] N85-33924
A search for gamma-ray point sources with the Carpet shower array
[OG-2.1-12] N85-33928
On some problems of gamma-astronomy
[OG-2.7-15] N85-33988

ACADEMY OF SCIENCES (USSR), YAKUTSK.
Fluctuations of development maximum depth and nuclear composition of primary cosmic radiation
[OG-5.1-13] N85-34054
Estimation of composition of cosmic rays with E sub zero approximately equals 10(17) - 10(18) eV
[OG-5.1-14] N85-34055
All particle energy spectrum of cosmic rays in 10 to the 15th power - 10 to the 20th power eV region
[OG-5.1-15] N85-34056
EAS spectrum in the primary energy region above 10 to the 15th power eV by the Akeno and Yakutsk array data
[OG-5.1-16] N85-34057
Cosmic ray spectra measurements at the Yakutsk EAS array
[OG-5.1-17] N85-34058
On galactic origin of cosmic rays with energy up to 10(19) eV
[OG-5.4-15] N85-34091

ADELAIDE UNIV. (AUSTRALIA).
Observation of gamma-rays from LMC X-4 above 10(16) eV
[OG-2.6-10] N85-33972
Energy spectrum of extragalactic gamma-ray sources
[OG-2.7-13] N85-33986
A new measurement of the cosmic ray energy spectrum between 3 x 10 to the 15th power eV and 3 x 10 to the 16th power eV
[OG-5.1-6] N85-34048
EAS Cerenkov measurements of the composition of the cosmic ray flux around 10 to the 16th power eV
[OG-5.2-11] N85-34067
Search for bursts in air shower data
[OG-5.3-10] N85-34076
Air shower arrival directions measured at Buckland Park
[OG-5.3-11] N85-34077
Anisotropy and the knee of the energy spectrum
[OG-5.4-10] N85-34087

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Management of Corrosion
[AGARD-LS-141] N85-33238

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Generation by conformal mappings of aerofoil sections and of certain other simple shapes suitable for both aerodynamic and stress-concentration problems
[AD-A154901] N85-33112

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[DE85-011385] N85-33593

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[OG-3.1-5] N85-33993

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Environmental summary for calendar year 1984
[DE85-012020] N85-33604

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Evaluation of coordinate measuring machines
[DE85-011712] N85-33467

AMES LAB., IOWA.
Ames Laboratory measurements of alkali levels in the Curtiss-Wright PFBC gas stream
[DE85-011357] N85-33214

ANDLAUER (GERARD), MUNDELSHEIM (FRANCE).
The coorbital hypothesis N85-33890

APPLIED ENERGY SCIENCES, INC., LOS ANGELES, CALIF.
A new large-scale, high-resolution multicolor software display concept
[AD-A155404] N85-33703

ARGONNE NATIONAL LAB., ILL.
Recent advances in d-c relaxation techniques for the measurement of kinetics of fast electrode reactions
[DE85-005029] N85-33216
In-situ observations of the development of heavy-ion damage in semiconductors
[DE85-010289] N85-33307
Remote temperature-set-point controller
[DE85-011614] N85-33459
Transfer of battery technology developed by the US Department of Energy
[DE85-009868] N85-33588
Use of monitors in Pascal on the Lemur: A tutorial on the barrier, self-scheduling FOR-loop, and askfor monitors
[ANL-84-53] N85-33706
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
Microdosimetric spectra measurements of JANUS neutrons
[DE85-012108] N85-33801
Electric vehicle operations by the City of Huntsville, Alabama, March 1983 - May 1984
[DE85-005913] N85-33842

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ARIZONA UNIV., TUCSON.
Impact processes and their implications for planetary formation and early evolution N85-33860
Volatiles on satellites of the outer solar system N85-33868
Solar variability observed through changes in solar figure and mean diameter
[DE85-012857] N85-33900
Propagation and secondary production of low energy antiprotons in the atmosphere
[OG-6.1-3] N85-34094

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Automatic sphericity interferometer for testing lens radii
[AD-A155736] N85-33457

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Extended atmospheres of outer planet satellites and comets
[NASA-CR-176137] N85-33848

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B

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Atmospheric reaction products from hazardous air pollutant degradation
[PB85-185841] N85-33620

BDM CORP., MCLEAN, VA.
Advanced beamed-energy and field propulsion concepts
[NASA-CR-176108] N85-33186

BECHTEL NATIONAL, INC., SAN FRANCISCO, CALIF.
Proposed resource evaluation plan. Salton Sea scientific drilling program
[DE85-011294] N85-33633
Design improvements and cost reductions for a 5000 MWh superconducting Magnetic Energy Storage plant
[DE85-010572] N85-33830

BEIJING TEACHERS COLL. (CHINA).
Relativistic electron in curved magnetic fields
[OG-6.2-11] N85-34110

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Development of solid thorium-232 reference materials
[DE85-011453] N85-33785

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[OG-5.2-6] N85-34063

BETTIS ATOMIC POWER LAB., WEST MIFFLIN, PA.
Automatic capability to store and retrieve component data and to calculate structural integrity of these components
[DE85-012429] N85-33726
BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA).
Periodic gamma-ray emissions from Geminga at or = 10(12) eV
[OG-2.4-2] N85-33949
BHABHA ATOMIC RESEARCH CENTRE, KASHMIR (INDIA).
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[OG-2.1-10] N85-33926
Relevance of cosmic gamma rays to the mass of gas in the galaxy
[OG-3.1-8] N85-33996
Excess gamma rays from the Loop I supernova remnant
[OG-3.1-10] N85-33998
Long term variability of the cosmic ray intensity
[OG-3.1-11] N85-33999
BIRMINGHAM UNIV. (ENGLAND).
COS-B gamma-ray sources and interstellar gas
[OG-3.1-9] N85-33997
BOEING AEROSPACE CO., SEATTLE, WASH.
Space station automation and robotics study. Operator-systems interface
[NASA-CR-176095] N85-33172
BOEING COMMERCIAL AIRPLANE CO., SEATTLE, WASH.
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[FAA/PM-85-19] N85-33700
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[DE85-011740] N85-33591
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Ultra high energy gamma rays, cosmic rays and neutrinos from accreting degenerate stars
[OG-2.2-5] N85-33931
BREMEN UNIV., (WEST GERMANY).
Decentralized control of dynamically interconnected systems
[BU-111] N85-33744
BRIGHAM YOUNG UNIV., PROVO, UTAH.
Supercritical fluid chromatography/supersonic jet spectroscopy
[DE85-007005] N85-33221
BRISTOL UNIV. (ENGLAND).
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region 34 or = Z or = 48
[OG-4.4-3] N85-34036
Ariel 6 measurements of ultra-heavy cosmic ray fluxes in the region Z or = 48
[OG-4.4-4] N85-34037
BRITISH AEROSPACE PUBLIC LTD. CO., STEVENAGE (ENGLAND).
The use of perfluoroether lubricants in unprotected space environments N85-33523
BROOKHAVEN NATIONAL LAB., UPTON, N. Y.
Hit-size effectiveness theory applied to high doses of low LET radiation for pink mutations in Tradescantia
[DE85-011835] N85-33657
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659
Practical consequences of the assessment of different energy health risks
[DE85-004538] N85-33696
Photoionization of alkali and alkaline earth atoms: Na and Mg
[DE85-011812] N85-33755
Saturation of a longitudinal instability due to nonlinearity of the wake field
[DE85-012514] N85-33761
Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765
Scientific Opportunities with Advanced Facilities for Neutron Scattering
[DE85-012113] N85-33770
Acceleration of polarized H(-) in the BNL 200 MeV linac
[DE85-011836] N85-33777
Ultrahigh vacuum system of the heavy ion transport line at Brookhaven
[DE85-011838] N85-33778
Commissioning the polarized beam in the AGS
[DE85-010958] N85-33788
Polyethylene solidification of low-level wastes
[DE85-012568] N85-33799
BROWN AND ROOT, INC., HOUSTON, TEX.
Low-head hydroelectric power demonstration project: City of Gonzales, Texas
[DE85-010403] N85-33595
BROWN UNIV., PROVIDENCE, R. I.
Venus, Earth and Mars: Present bounds on similarities and differences in bulk composition N85-33876
BULGARIAN ACADEMY OF SCIENCE, SOFIA.
Search for excess showers from Crab Nebula
[OG-2.3-2] N85-33939
EAS fluctuation approach to primary mass composition investigation
[OG-5.2-5] N85-34062
Implication of EAS data for the study of primary cosmic rays above 10 to the 5th power GeV
[OG-5.2-7] N85-34064
BUREAU OF MINES, ALBANY, OREG.
Thermodynamic data for mineral technology
[PB85-184331] N85-33560
BUREAU OF RECLAMATION, DENVER, COLO.
Oxidation of formaldehyde solutions used for the preservation of reverse osmosis membranes
[PB85-185585] N85-33194
Implementation of polymer impregnation as a bridge deck sealant
[PB85-185718] N85-33265

C

CALIFORNIA INST. OF TECH., PASADENA.
Consortium program for the study of boron-rich borides
[DE85-011378] N85-33260
Volatile loss following very large impacts N85-33862
The polar caps and the climatic evolution of Mars N85-33866
Mineralogy and chemistry of the Earth N85-33877
Dynamic compensation of Venus's geoid: A comparison with Earth N85-33888
Cosmic ray He-3 measurements
[OG-4.2-3] N85-34023
Initial results from the Caltech/DRSI balloon-borne isotope experiment
[OG-4.3-8] N85-34033
Elemental abundances of cosmic rays with Z 33 as measured on HEAO-3
[OG-4.4-5] N85-34038
CALIFORNIA UNIV., BERKELEY.
Fracture detection and characterization for geothermal reservoir definition
[DE85-008677] N85-33630
Capabilities of the LDEF-2 heavy nuclei collection
[OG-4.4-8] N85-34040
CALIFORNIA UNIV., BERKELEY. LAWRENCE BERKELEY LAB.
Solid state radiative heat pump
[DE85-011605] N85-33303
Critical current density and microstructural state of an internal tin multifilamentary superconducting wire
[DE85-009966] N85-33308
Enthalpy transients in fractured two-phase geothermal systems
[DE85-011988] N85-33587
Technology transfer report: Feasibility study for the use of geothermal brine in the Ashdod area, Israel
[DE85-013316] N85-33598
Discontinuous deformation analysis
[DE85-011208] N85-33628
Advanced instrumentation for Positron Emission Tomography
[DE85-011147] N85-33779
Heavy ion medical accelerator options
[DE85-011204] N85-33784
CALIFORNIA UNIV., DAVIS.
Pressure correlations in turbulent reacting flows N85-33205
CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Effects of residual stresses and distortion on the nickel 200 and stainless steel 304 weldments
[DE85-011868] N85-33233
Superheated fuel injection for combustion of liquid-solid slurries
[DE85-011624] N85-33266
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
Transparent electrode for optical switch
[DE85-011618] N85-33310
Two-dimensional simulation of instability growth due to shocks
[DE85-011869] N85-33442
Gradient scaling for nonuniform meshes
[DE85-009625] N85-33443
Effects of laser radiation on surfaces and coatings
[DE85-010475] N85-33484
Generation of round bores in composite structure railguns
[DE85-011872] N85-33501
ARAC status report, 1985
[DE85-012835] N85-33603
Environmental monitoring at Lawrence Livermore National Laboratory: 1984 report
[DE85-011593] N85-33606
Flat is not necessarily good
[DE85-012819] N85-33723
SMACS: A system of computer programs for probabilistic seismic analysis of structures and subsystems. Volume 1: User's manual
[DE85-011853] N85-33724
Some ideas for decomposing the domain of elliptic partial differential equations in the Schwarz process
[DE85-011844] N85-33739
Bibliography and index for nuclear reactions among light charged particles, volume 26
[DE85-011482] N85-33768
Materials characterization with intense positron beams
[DE85-011850] N85-33769
Electron and ion cyclotron heating calculations in the tandem-mirror
[DE85-011858] N85-33797
Ultraviolet radiation-damage absorption peak in solid deuterium-tritium, revision 1
[DE85-012969] N85-33806
Blanket optimization studies for Cascade
[DE85-010002] N85-33824
Role of ECRH in potential formation for tandem mirrors
[DE85-011859] N85-33834
Planetary fluids He and NH3 at high shock pressures and temperatures
[DE85-011851] N85-33896
On the emission region of gamma ray bursts
[OG-1.1-4] N85-33906
CALIFORNIA UNIV., LOS ANGELES.
Key issues of fusion nuclear technology development (FINESSE)
[DE85-012599] N85-33817
Relationships between chondritic meteorites and planets N85-33851
On the importance of viscous dissipation in Io N85-33873
Primordial magmaspheres and their lasting consequences N85-33882
Admittance functions from Venus vertical gravity and modes of topographic support N85-33889
Geochemical confirmation of the lunar magmasphere hypothesis N85-33895
Linear filters as a method of real-time prediction of geomagnetic activity
[DE85-010760] N85-33899
CALIFORNIA UNIV., RIVERSIDE.
Gamma rays of 0.3 to 30 MeV from PSR 0531+21
[OG-2.3-8] N85-33945
CALIFORNIA UNIV., SAN DIEGO.
Comments on two matters related to turbulent combustion N85-33204
Spectrum of the gamma-ray diffuse component observed from HEAO-1
[OG-3.1-12] N85-34000
CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
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HEAO-1 observations of gamma ray bursts
[OG-1.1-1] N85-33903
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The interpretation of flying qualities requirements for flight control system design
[NASA-CR-177942] N85-33125
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[DE85-011946] N85-33261
Detection of gamma-ray lines from the direction of the Crab Nebula N85-33943
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[OG-1.2-1] N85-33912
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[OG-2.4-13] N85-33957

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The French space program N85-33127

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[OG-4.4-10] N85-34041

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[CISE-2515] N85-33617

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[CTH-MATH-1985-01] N85-33748
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[CTH-MATH-1985-04] N85-33750

CHICAGO UNIV., ILL.
Noble gases in meteorites and terrestrial planets N85-33850
Interstellar propagation and the isotopic composition of hydrogen in the galactic cosmic rays
[OG-4.2-1] N85-34021
The isotopic composition of cosmic ray chlorine
[OG-4.3-3] N85-34028
The isotopic composition of cosmic ray calcium
[OG-4.3-5] N85-34030
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[OG-6.2-6] N85-34105

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[OG-4.3-9] N85-34034

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Pagosa Springs geothermal project
[DE85-011308] N85-33583

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[NASA-CR-176130] N85-33248

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[PB85-177335] N85-33838

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[OG-2.1-3] N85-33920
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[OG-5.1-5] N85-34047

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[PB85-181477] N85-33289

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[OG-2.5-1] N85-33958
Galactic gamma-ray sources, SNOBs, and giant H2 regions
[OG-2.5-4] N85-33961
Local interstellar medium and gamma-ray astronomy
[OG-3.1-1] N85-33989
Gamma-ray line emission from Al-26 produced by Wolf-Rayet stars
[OG-3.2-5] N85-34003
Source spectral index of heavy cosmic ray nuclei
[OG-4.1-2] N85-34008
Charge and energy dependence of the residence time of cosmic ray nuclei below 15 GeV/nucleon
[OG-4.1-3] N85-34009
A new analysis of cosmic ray isotopes at 3 GeV/n from HEA03-C2 data
[OG-4.3-6] N85-34031
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[OG-6.2-10] N85-34109

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[COMMITTEE-PRINT-99-F] N85-33601

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Fatigue behavior of chromium-containing ferritic steels at elevated temperature
[DE85-012309] N85-33231
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[DE85-008168] N85-33482

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[OG-1.2-4] N85-33914

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[DRIC-T-7481] N85-33188
Determination of organobromide compounds in water by gas chromatography-negative ion chemical ionisation mass spectrometry
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On the relationship between electronics and chemistry
[DRIC-T-7480] N85-33200
Numerical experiment of elastic wave propagation by framework model
[DRIC-T-7462] N85-33511
Chemoreception and detection of micropollutants by means of a telemetric bionic detector
[DRIC-T-7460] N85-33600
Thermal stress suffered by tank crews working in summer heat
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NMR in the 80 s: New nuclei, new pulses
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Measurements of galactic hydrogen and helium isotopes from 1978 through 1983
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Electronic temperature equalizer
[PB85-181485] N85-33475

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The 1984 environmental monitoring program report for Idaho National Engineering Laboratory site
[DE85-011209] N85-33611

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Arctic and offshore research
[DE85-001995] N85-33853

DEPARTMENT OF ENERGY, WASHINGTON, D. C.
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
Dispersion toughened ceramic composites and method for making same
[DE85-011601] N85-33252
Metallic glass composition
[DE85-011594] N85-33253
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
Electron-donor dopant, method of improving conductivity of polymers by doping therewith, and a polymer so treated
[DE85-011640] N85-33257
Polymer blends for use in photoelectrochemical cells for conversion of solar energy to electricity
[DE85-011602] N85-33258
Radiation-hardened polymeric films
[DE85-011636] N85-33259
Superheated fuel injection for combustion of liquid-solid slurries
[DE85-011624] N85-33266
Batteryless magneto-driven portable radiac
[DE85-011622] N85-33300
Quantitative determination of mineral composition by powder X-ray diffraction
[DE85-011654] N85-33301
Thermoelectric generator and method for the fabrication thereof
[DE85-011650] N85-33302
Solid state radiative heat pump
[DE85-011605] N85-33303
Precision linear ramp function generator
[DE85-011647] N85-33304
Electron beam enhanced surface modification for making highly resolved structures
[DE85-011609] N85-33305
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Transparent electrode for optical switch
[DE85-011618] N85-33310
Integrated current collector and catalyst support
[DE85-011616] N85-33311
Switching power supply
[DE85-005993] N85-33312
Drying of pulverized material with heated condensible vapor
[DE85-011656] N85-33438
Woven heat exchanger
[DE85-011633] N85-33439
Heat sinking for printed circuitry
[DE85-011585] N85-33440
Apparatus and method for identification of matrix materials in which transuranic elements are embedded using thermal neutron capture gamma-ray emission
[DE85-011659] N85-33454
Remote temperature-set-point controller
[DE85-011614] N85-33459
Capacitance measuring device
[DE85-011643] N85-33460
Shear wave transducer for boreholes
[DE85-011662] N85-33461

Fiber optic moisture sensor
[DE85-011651] N85-33462

Wide-ranging radiation dose monitor
[DE85-011596] N85-33463

Electrochemical methane sensor
[DE85-011663] N85-33464

On-line temperature sensor
[DE85-011641] N85-33465

Vacuum ultraviolet laser
[DE85-011632] N85-33478

Device for frequency modulation of a laser output spectrum
[DE85-011634] N85-33479

Electro-optic harmonic conversion to switch a laser beam out of a cavity
[DE85-011619] N85-33483

Latch assembly
[DE85-011660] N85-33492

Method and apparatus for casting conductive and semi-conductive materials
[DE85-011655] N85-33494

Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495

Portable cutting apparatus
[DE85-011635] N85-33496

Mechanical connection for a tubular assembly
[DE85-011590] N85-33497

Non-bonded ultrasonic transducer
[DE85-011006] N85-33504

Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576

Molten carbonate fuel cell separator
[DE85-011615] N85-33577

Electrolytic cell
[DE85-011598] N85-33578

Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599

Salinity driven oceanographic upwelling
[DE85-011664] N85-33652

Antihypertensive neutral lipid
[DE85-011625] N85-33656

Polarization of fast particle beams by collisional pumping
[DE85-011621] N85-33764

Corrosion resistant storage container for radioactive material
[DE85-011666] N85-33765

Measurement of radionuclides in waste packages
[DE85-011674] N85-33766

Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767

Office of Civilian Radioactive Waste Management
[DE85-012585] N85-33774

System and method of operating toroidal magnetic confinement devices
[DE85-011670] N85-33814

Elmo bumpy square plasma confinement device
[DE85-011628] N85-33816

Magnetic Fusion Program plan
[DE85-009861] N85-33823

Apparatus and method for the horizontal, crucible-free growth of silicon sheet crystals
[DE85-011588] N85-33829

Superconducting magnetic energy storage for asynchronous electrical systems
[DE85-005986] N85-33832

DEPARTMENT OF THE AIR FORCE, WASHINGTON, D.C.

Soil extraction kit
[AD-D011736] N85-33190

Method of characterizing critical timing paths and analyzing timing related failure modes in very large scale integrated circuits
[AD-D011731] N85-33298

Electrochromic display device
[AD-D011733] N85-33299

Transceiver test device
[AD-D011728] N85-33458

Robotic order picking
[AD-D011737] N85-33493

Microcomputer controlled image processor
[AD-D011734] N85-33735

Removable cleanable antireflection shield
[AD-D011735] N85-33810

Process for improving the quality of epitaxial silicon films grown on insulating substrates
[AD-D011730] N85-33828

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Rechargeable lithium-organic electrolyte battery having overcharge protection and method of providing overcharge protection for a lithium-organic electrolyte battery
[AD-D011738] N85-33575

Dual optical mechanical position tracker
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Features of the solar array drive mechanism for the space telescope N85-33532

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Tritium-helium effects in metals
[DE85-011507] N85-33235

Future of robots in nuclear plants and processes
[DE85-011505] N85-33500

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[DE85-012322] N85-33802

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[OG-2.3-12] N85-33948

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[OG-2.1-8] N85-33925

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[OG-2.2-6] N85-33932

The 1000 GeV gamma ray emission from radio pulsars N85-33946

The 1000 GeV gamma rays from ms pulsars
[OG-2.3-12] N85-33948

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[OG-2.6-11] N85-33973

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E

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[ENST-84E017] N85-33284

Phonetic transcription statistics: Constitution and statistical utilization
[ENST-85D001] N85-33285

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[ENST-84E018] N85-33705

EDGERTON, GERMESHAUSEN AND GRIER, INC., GOLETA, CALIF.

New and revised methods of purifying mercuric iodide
[DE85-011684] N85-33237

EDGERTON, GERMESHAUSEN AND GRIER, INC., IDAHO FALLS, IDAHO.

Centrifugal castings of stainless steel spiked with radioactive tracers
[DE85-012003] N85-33234

Woven heat exchanger
[DE85-011633] N85-33439

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F

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[DE85-013245] N85-33276

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[PB85-198489] N85-33279

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[FAA-AC-43-16] N85-33117

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[FUB-14-1984] N85-33746

G

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[AD-A155715] N85-33710

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[NASA-CR-174957] N85-33540

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[NASA-CR-176099] N85-33170

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Development of improved thermoelectric materials for space nuclear power systems
[DE85-013079] N85-33807

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Modeling of turbulent recirculating combusting flows N85-33212

GENERAL MOTORS CORP., WARREN, MICH.

Land vehicle corrosion management N85-33246

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Geologic processes on Venus: An update N85-33883

Mars landing sites N85-33893

GEORGIA INST. OF TECH., ATLANTA.

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[NASA-CR-176078] N85-33847

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Automatic rotary valve actuator
[DE85-012797] N85-33505

H

HARRIS CORP., MELBOURNE, FLA.

Implementation of the SITAN algorithm in the digital terrain management and display system
[DE85-010659] N85-33115

HAWAII UNIV., HONOLULU.

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[OG-5.2-4] N85-34061
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[NASA-CR-176154] N85-33456
HONG KONG UNIV.
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[OG-2.5-12] N85-33967
Cosmic gamma rays from quasars
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[OG-5.2-12] N85-34068
Cosmic ray intensity variations at primary rigidities near 1900 GV
[OG-5.3-0] N85-34075
Reestimation of the production spectra of cosmic ray secondary positrons and electrons in the ISM
[OG-6.2-8] N85-34107
HOUSTON UNIV., TEX.
Theory of cellwise optimization for solar central receiver system
[DE85-012586] N85-33579
HUGHES AIRCRAFT CO., EL SEGUNDO, CALIF.
Six mechanisms used on the SSM/1 radiometer N85-33534
Ultrasonic seam welding on thin silicon solar cells
[NASA-CR-176116] N85-33570
HUGHES AIRCRAFT CO., LOS ANGELES, CALIF.
Liquid crystal light valve structures
[NASA-CASE-MSC-20036-1] N85-33826
HUGHES AIRCRAFT CO., TORRANCE, CALIF.
Sixty GHz IMPATT diode development
[NASA-CR-174969] N85-33293
HUGHES RESEARCH LABS., MALIBU, CALIF.
Striation free doped silicon
[AD-A155730] N85-33827
Refractive indices and thermo-optic coefficients of nonlinear crystals isomorphic to KH2PO4
[DE85-012968] N85-33831
HYDRAULIC RESEARCH TEXTRON, IRVINE, CALIF.
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180

I

ILLINOIS UNIV., URBANA.
Modulation doped GaAs/Al(x)Ga(1-x)As layered structures with applications to field effect transistors
[AD-A155360] N85-33296
Implementing linear multistep formulas for solving DAES
[DE85-012400] N85-33740
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[CFD/84/5] N85-33447
The calculation of two-dimensional buoyant surface jets with the k-W model of turbulence
[CFD/84/21] N85-33448
Computer and water-model simulation of flow through poppet valves
[CFD/85/2] N85-33449
INDIANA UNIV., BLOOMINGTON.
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[NASA-CR-176128] N85-33189
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[ISL-CO-207/84] N85-33178
Combustion-deflagration-detonation transition in a confined spherical powder
[ISL-R-108/84] N85-33223
Behavior of the porous bed in a combustion-deflagration-detonation transition
[ISL-CO-220/84] N85-33224
Combustion-deflagration-detonation transition
[ISL-CO-221/84] N85-33225
Gas composition and molecule velocity in the detonation products of pentaerythritol tetranitrate (PETN) in expansion in a high vacuum container. Analysis by mass spectroscopy and time of flight spectrometry
[ISL-R-109/84] N85-33226
Hydrazine nitrate based explosives
[ISL-CO-229/84] N85-33272
Laser Doppler Anemometer (LDA) measurements in the turbulent near-wake of blunt bodies
[ISL-CO-212/84] N85-33450
Measurement of velocity and concentration in free jets
[ISL-CO-215/84] N85-33451
Experimental simulation of in-bore flows using a high pressure shock tube
[ISL-CO-217/84] N85-33452
Holographic cinematography with the help of a pulse YAG laser
[ISL-CO-213/84] N85-33472
Cinehologrophy
[ISL-CO-214/84] N85-33473
New method for compensating and measuring any motion of three-dimensional objects in holographic interferometry
[ISL-CO-216/84] N85-33474
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[ISL-R-105/84-PT-2C] N85-33486
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[ISL-CO-218/84] N85-33488
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[ISS-T-84/6] N85-33471

J

JET PROPULSION LAB., CALIFORNIA INST. OF TECH., PASADENA.
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[NASA-CR-176133] N85-33176
Research and development activities in unified control-structure modeling and design
[NASA-CR-176129] N85-33179
Research and development activities in unified control-structure modeling and design
[NASA-CR-176111] N85-33180
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
Advanced beamed-energy and field propulsion concepts
[NASA-CR-176106] N85-33186
Cryogenic laser calorimetry for impurity analysis
[NASA-CR-176102] N85-33201
Experimental studies of glass refining
[NASA-CR-176130] N85-33248
Solid-melt interface studies of high-speed silicon sheet growth
[NASA-CR-176112] N85-33249
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251
Evaluation of semiconductor devices for Electric and Hybrid Vehicle (EHV) ac-drive applications, volume 2
[NASA-CR-176103] N85-33294
The Galeleo spacecraft magnetometer boom N85-33513
Dual arm master controller development N85-33526
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564
Laser-assisted solar cell metallization processing
[NASA-CR-176124] N85-33565
Ultrasonic seam welding on thin silicon solar cells
[NASA-CR-176116] N85-33570
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells
[NASA-CR-176109] N85-33571
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651
Federal export assistance programs applicable to the US photovoltaic industry
[NASA-CR-176114] N85-33841
Magnetotails of the terrestrial planets: A comparative study N85-33875
Compressional environment in the location and orientation of planetary dorsa and terrestrial earthquake fault structures N85-33885
Gamma ray burst size-frequency distributions: Spectral selection effects
[OG-1.2-3] N85-33913
Gamma-ray burst variability above 4 MeV
[OG-1.2-7] N85-33917
Very high energy gamma rays from the Crab Nebula
[OG-2.3-3] N85-33940
HEAO 3 upper limits to the expected 1634 KeV line from SS 483
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High-resolution spectrum of Cygnus X-1
[OG-2.4-12] N85-33956
Galactic distribution of interstellar Al-26
[OG-3.2-3] N85-34002
Diffuse galactic annihilation radiation from supernova nucleosynthesis
[OG-3.2-8] N85-34004
JET PROPULSION LAB., LA CANADA, CALIF.
Interpretation of photometric measurements of airless bodies N85-33871
JOHN B. PIERCE FOUNDATION OF CONNECTICUT, NEW HAVEN.
Microwave radiation and thermoregulation
[AD-A155718] N85-33654
JOHNS HOPKINS UNIV., BALTIMORE, MD.
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[AD-A155405] N85-33753
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Special tools used by cosmonauts in EVA N85-33129
Cosmonauts participate in multilevel remote sensing experiment N85-33130
Salyut-7 cosmonauts work with RS-17 and GSPS X-ray telescopes N85-33131
Comments on RS-17 X-ray telescope N85-33132
Astron telescope stabilization system N85-33133

Results from Astron orbiting telescope N85-33134
Yakutsk Institute's cosmic ray research facility N85-33135
Radio telescope with 256 antennas built in Siberia N85-33136
Astron X-ray experiment N85-33137
Program for observations of Halley's comet N85-33138
Results and prospects of physiological research during spaceflights N85-33139
Intracardiac hemodynamics and human heart function in simulated weightlessness N85-33140
Cosmonauts' cardiovascular system function during long-term orbital flights aboard Salyut-6 station N85-33141
Mathematical analysis of heart rhythm assessment of distinctive features in adaptation to spaceflight conditions N85-33142
Mechanisms of osteodystrophy in weightlessness N85-33143
Effects of environment on spacecraft materials N85-33144
Prospective uses for diffusion welding in vacuum N85-33145
One method of solving the problem of unsteady heat exchange of a body and its ablation N85-33146
Spacecraft-aided research discussed at geology Congress N85-33147
Enhancing precision of remote temperature sensing data from satellites under cloudy atmospheric conditions N85-33148
Impact of fluctuations in optical properties of atmosphere on the ratio of spectral brightness from remote sensing of agricultural land N85-33149
Determination of altitude of cloud cover top from Meteor satellite data N85-33150
Landscape interpretation capabilities using space photographs of regions of a multistage platform mantle structure N85-33151
Interpretation of multiband photographs made during Telefoto-80 experiment for the purpose of discriminating agricultural crops N85-33152
Use of space photographs for analysis of structural and dynamic conditions of formation of ancient phiogopite and apatite deposits N85-33153
Using remote photographs in prospecting for hydrocarbons on the Kerch Peninsula N85-33154
Cataloging the spectral brightness coefficients of the forested region of the European territory of the USSR N85-33155
Regression analysis of aircraft and ground measurement data on vegetation cover N85-33156
Direct regression analysis of remote sensing data (using example of grass cover) N85-33157
Interactive procedures for discriminating and restoring contour line networks N85-33158
Terrain illumination conditions when taking scanning photographs from space N85-33159
Calculating solar highlight and shadeless areas for scanning photographs from space and optimizing lighting conditions N85-33160
Discrimination of linear contour elements of space photographs based on visual perception model N85-33161
Physico-geographical regionalization of Caspian lowland based on space survey materials N85-33162
Mapping of dynamics of deltas by space photography N85-33163
Comprehensive mapping of arid territories of Arizona using space photography N85-33164
Repetition of dense cloud cover above Indian Ocean from generalized satellite data N85-33165
USSR report: Electronics and electrical engineering [JPRS-UEE-84-015] N85-33314
Signal processing in quasi-holographic system as an inverse problem N85-33315
Method of static measurements of absolute scattering matrix of radar targets N85-33316
Selectivity of weight compensator of passive interference to unknown velocities of detectable targets N85-33317
Comprehensive radio direction finder with electronically stabilized radiation pattern N85-33318
Characteristics of digital range finder with stroboscopic discretization N85-33319
Amplitude stabilization of pulse signals N85-33320
Vatra telvision complex for Salyut orbital space station N85-33321
Potential coordinate estimate accuracy estimation accuracy by multiposition radar systems N85-33322
Optimal complex nonlinear processing of continuous and pulsed signals N85-33323
Detection of signals from coherent pulsed radars with random variation in parameters of sounding signals from pulse to pulse against background of worst-case Gaussian noise N85-33324
Synthesis of adaptive filters for tracking radio systems N85-33325
Digital holographic systhesis of pattern-forming transparencies for ring antenna arrays N85-33326
Variation in radiowave propagation conditions in corona during solar activity cycle N85-33327
Adaptive synthesis of antennas with separation of signals by direction of arrival N85-33328
Comparative characteristics of optical multiposition pulse signals with intersymbol distortion N85-33329
Refraction of narrow probing light beam in multilayer optical fiber N85-33330
Temperature sensitivity of fiber-optic transmission line N85-33331
Depth dimension compression of 3-D images N85-33332
LI481 and LI482 vidicons for two-tube color TV cameras with improved image quality N85-33333
Noise in stages and in interstage couplings of various transistor circuits N85-33334
Probabilistic analysis of automatic control systems for detection systems N85-33335
High-speed adaptation algorithm for harmonic corrector N85-33336
Adaptive corrector operating in frequency domain N85-33337
Transformation of spectrum of phase-code keyed signal for scanning in time N85-33338
Digital matched filter N85-33339
Hardware realization of digital filters without multipliers N85-33340
Design of high-order analog and digital filters with identical sections N85-33341
State of art and development problems in computer-aided design of electronic circuits N85-33342
Modeling of electronic circuits with high degree of component integration N85-33343
Basic features of personal computers N85-33344
Adaptive modeling of electronic circuits N85-33345
Diakoptic calculation of characteristics for optimization of linear circuits with respect to parameters of individual branches N85-33346
Algorithms and organization of software for computer-aided circuit design N85-33347
Art of programming programmable microcalculators: Calculation of response from current values of action N85-33348
Computer simulation of integrated injection logic N85-33349
Numerical simulation of nonisothermal transient processes in GaAs diode structures N85-33350
Modeling of discrete devices with use of multivalued logic and nomograms N85-33351
Software for frequency analysis of microwave circuits N85-33352
System for computer-aided design of analog electronic circuits N85-33353
Optimization of radioelectronic circuits with software for modeling of integrated circuits on unified system computer N85-33354
Dialog system with minicomputer for plotting performance charts N85-33355
Algorithms for constructing models of circuit elements in input language of computer-aided design software N85-33356
Algorithm for determination of isomorphic graphs N85-33357
Method of estimating convergence of Haar coefficients in message compression problems N85-33358
Determination of sensitivity functions for discrete dynamic systems from results of function modeling on digital computer N85-33359
Analysis of crosstalk in nonhomogeneous multiconductor lines N85-33360
Synthesis of optimum receiver and processor for interfering radio pulse signals N85-33361
System of microprocessor instructions N85-33362
Buildup of electric charge in foil dielectrics during gamma irradiation N85-33363
Partial discharges in and electric strength of high-voltage polymer insulation at cryogenic temperatures N85-33364
Methods of reliability design of semiconductor power devices N85-33365
Influence of edge effects on performance of electrooptical lens N85-33366
Design of electrooptical system with annular cathode and electrostatic compressor N85-33367
Design of inductive shift transducers N85-33368
Quantizer of images of heat fields obtained by Rubin-type infra-red imagers N85-33369
Magnetic shielding with superconductors based on niobium-tin compounds N85-33370
Analysis of solution of Bloch's equations in time domain N85-33371
Recording small frequency drifts of microwave oscillators N85-33372
Calculation of external magnetic field of a shielded transformer N85-33373
Optimization of design parameters for alternating current stabilizer based on magnetic suspension N85-33374
Standard series of direct-current motors for regulated electric drives N85-33375
Effect of polymer additives on characteristics of direct-current motor with liquid dielectric filler N85-33376
Induction motors with minimum waste of magnetic iron N85-33377
Magnetic field and equivalent circuit of induction motors with shielded poles N85-33378
Sliding discharge in CO2 and excimer lasers N85-33379
Conferences of quantum-radiooptics section N85-33380
USSR report: Electronics and electrical engineering [JPRS-UEE-84-003] N85-33381
On the principle of uniformity of satellite communications systems N85-33382
International prototype network in Dubna experimental satellite communications system N85-33383
Basic properties and interpretation of synthesized radar images of sea waves with long synthetization time N85-33384
Multitrunk high-frequency multiplexing of antenna-waveguide channels N85-33385
Method of constructing folding umbrella-type antenna N85-33386
Frequency independent parabolic phased antenna array of log periodic antennas N85-33387
Minimizing field scattered by slender dipoles N85-33388
Transmitter spectrum analyzer N85-33389
Module for interfacing microprocessors and microcomputer N85-33390
Predicting electrical performance parameters of underwater cables N85-33391
Design of digital bandpass filters with finite memory N85-33392
Maximally flat approximation of attenuation characteristics of coupled-line filters N85-33393
Miniature two-mode filters N85-33394
Method of designing digital band-pass filters with pulse response of finite duration N85-33395
Generalization of discrete Fourier transform for interpolation in time domain N85-33396
Optimum predistortion of digital signals for transmission over parallel channels N85-33397
Estimate of signal-to-interference energy ratio in discrete-data transmission N85-33398
Efficiency of discrimination in some invariant signal transformations N85-33399
Generalization of discrete Fourier transformation for interpolation in time domain N85-33400
Optimality criterion for high-frequency channel in receivers of discrete radio signals N85-33401
Controllable companding in low-frequency FM radio communication systems N85-33402
Gradiental adaptive corrector with optimum tuning step N85-33403
Nonlinear filtration of clutter N85-33404
Synthesis of system with nonideal components for optimal processing of radio signal N85-33405
Estimating optimum technical and economic indicators of data transmission systems N85-33406
Developmental trends in radio receiver design N85-33407
Synthesis of tests for programmable logic arrays N85-33408
Detection of and search for faults in programmable logic arrays N85-33409
Filtration of higher harmonic components in two-level digital computing synthesizers N85-33410
Art of programming programmable microcalculators, part 4: errors of calculations N85-33411
Examination of anisotropic films by resonance method N85-33412
Estimating angular position of optical radiation source when received by array of photodetectors N85-33413
KT3127A, KT3128A transistors N85-33414
TEMO and TEB thermoelectronic devices N85-33415
Digital tachometer N85-33416
General design principles of high speed frequency synthesizers based on phase synchronization systems N85-33417
Strongly coupled millimeter-band waveguide directional couplers N85-33418
Application of field similitude theory to calculation of stripline heating N85-33419
Fundamentals of radio optical theory of resonant and directional quasi-optical devices N85-33420

Waveguide dielectric millimeter band filter with enhanced selectivity N85-33421
Calculating dominant (quasi-t) mode group velocity in shielded microstrip line N85-33422
Study of nonlinear distortion in microwave amplifiers using Schottky gate field effect transistors N85-33423
Photothyristor optrons and optron microcircuits, part 1 N85-33424
Multidiode integrated-circuit protective device N85-33425
Pulsed lasers for filming color holographic film images N85-33426
Synthesis of metrico-topological model for layout of topology of large-scale-integration arrays N85-33427
Synthesis of high-speed devices using integrated operational amplifiers N85-33428
Characteristics of optical information-measurement channels with utilization of scattering effects N85-33429
Binary signal detection in acoustooptic receivers N85-33430
Asymmetry of diffraction orders with light diffraction at surface acoustic wave N85-33431
Mean intensity of wave reflected by wavefront reversing mirror in turbulent medium N85-33432
USSR report: Life sciences. Biomedical and behavioral sciences
[JPRS-UBB-85-018] N85-33660
Speech analysis system for assessing pilots' working fitness N85-33661
Formation of new microvessels in skeletal muscles of rats exposed to hypobaric hypoxia for one week N85-33662
Effects of immobilization and high-altitude adaptation on energy metabolism in rats N85-33663
Effects of blood volume overload on myocardial ultrastructure in relation to adaptation to high altitude hypoxia N85-33664
Cardiorespiratory function and work performance during adaptation to industrial labor in midalpine conditions N85-33665
Structural changes in thyroid due to high-altitude adaptation in Kirghizia N85-33666
USSR report: Space Biology and Aerospace Medicine, volume 19, no. 2, March - April 1985
[JPRS-USB-85-004] N85-33667
Labyrinthine and extralabyrinthine mechanisms of development of motion sickness in weightlessness N85-33668
Psychophysiological distinctions of organization and regulation of daily cyclograms of crew activities during long-term spacecraft N85-33669
Operator's functional comfort zone when controlling moving object N85-33670
Rapid determination of cadet discipline by projective tests N85-33671
Effect of body position and immobilization on intensity of spatial illusions in weightlessness N85-33672
Typological characteristics of hemodynamic states of healthy subjects in orthostatic position N85-33673
Investigation of spectrum of human bile acids during 120-day antiorthostatic hypokinesia N85-33674
Vascular mechanisms of adaptation to antiorthostatic position N85-33675
Cerebral hemodynamics and ventricular function in -15 deg antiorthostatic position N85-33676
Effect of short-term antiorthostatic hypokinesia on dynamics of cardiorespiratory parameters during graded physical exercise N85-33677
Investigation of some aspects of amino acid metabolism in man during brief exposure to antiorthostatic hypokinesia combined with ultraviolet radiation N85-33678
General description of experiment dealing with rat ontogenesis aboard Cosmos-1514 biosatellite N85-33679
Morphological study of antiorthostatic hypokinesia in monkeys N85-33680
Rat plasma hormone levels following flight aboard Cosmos-1129 biosatellite N85-33681
Results of microbiological studies conducted during operation of Salyut-6 orbital station N85-33682
Distinctions in formation of microflora on construction materials used in habitable pressurized compartments N85-33683
Composition and dynamics of bacteriocenosis associated with algae in human life-support systems N85-33684
Experimental validation of allowable concentrations of sodium and potassium in recycled drinking water N85-33685
Mammalian tissue sensitivity to long-term exposure to high-intensity stationary magnetic fields N85-33686
Electroanesthesia as a means of controlling cold stress of local hypothermia N85-33687
Morphological manifestations of hemodynamic changes in lungs of monkeys submitted to antiorthostatic hypokinesia N85-33688
Regulation of physical activity in antiorthostatic position by acting on adrenosympathetic and hypophyseo-adrenocortical systems N85-33689
Effect of experimental motion sickness on postrotory nystagmus and counterrotation illusion N85-33690
Chemical composition of Musca domestica L. larval and pupal biomass when developing in organic waste of biological life-support system for man N85-33691
Effect of substrate moisture on growth and structure of corn leaf N85-33692

K

KENTUCKY UNIV., LEXINGTON.
Solids mixing in a three phase fluidized bed containing spherically shaped-porous solid particles
[PB85-187961] N85-33453
KIEL UNIV. (WEST GERMANY).
The flux of secondary anti-deuterons and antihelium produced in the interstellar medium
[OG-6.1-5] N85-34096
KMS FUSION, INC., ANN ARBOR, MICH.
Research study for gel precursors as glass and ceramic starting materials for space processing applications research
[NASA-CR-176113] N85-33250
Search of the VAXintosh customizing VMS V4.0 for DCL windows
[DE85-011306] N85-33729

L

LANGUAGE SERVICES, NASHVILLE, TENN.
Process and device for forming imprints on ceramic tubes
[DE85-013137] N85-33264
LEEDS UNIV. (ENGLAND).
Observations of Cygnus X-3 above 10(15) eV from 1979 - 1984
[OG-2.1-6] N85-33923
Observations of potential ultra high energy gamma-ray sources above 10(15) eV
[OG-2.6-9] N85-33971
The primary cosmic ray spectrum above 10 to the 19th power eV
[OG-5.1-3] N85-34045
Arrival direction distribution of cosmic rays of energy 10 (18) eV
[OG-5.3-7] N85-34073
UHE particle production in close binary systems
[OG-5.4-7] N85-34084
LEHIGH UNIV., BETHLEHEM, PA.
Rationale in the selection of corrosion protective coating systems N85-33242
LEIDEN UNIV. (NETHERLANDS).
Cyg X-3: Not seen in high-energy gamma rays by COS-B
[OG-2.2-2] N85-33929
Inverse-Compton gamma rays in the galaxy
[OG-3.1-2] N85-33990
Constraints on the galactic distribution of cosmic rays from the COS-B gamma-ray data
[OG-3.1-6] N85-33994
LEWIN AND ASSOCIATES, INC., WASHINGTON, D. C.
Geologic, technical, and economic sensitivity analysis in support of the GRI (Gase Research Institute) tight gas reservoirs project area
[PB85-192276] N85-33559
LINCOLN LAB., MASS. INST. OF TECH., LEXINGTON.
Spectra and positions of galactic gamma-ray sources
[OG-2.5-7] N85-33963
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
Drag-compensated, precision-powered hinge system N85-33517
Appendange deployment mechanism for the Hubble Space Telescope program N85-33533
LODZ UNIV. (POLAND).
Unthermalized plasma in bursts sources
[OG-1.1-5] N85-33907
Search for ultra high energy gamma-rays from various sources
[OG-2.6-7] N85-33969
Some evidence for high energy gamma-ray sources at large galactic latitudes
[OG-2.7-5] N85-33978
Some evidence for large gravitational redshift in Seyfert galaxy NGC 4151
[OG-2.7-11] N85-33984

The primary cosmic ray mass composition at energies above 10(14) eV
[OG-5.4-6] N85-34063
Virgo cluster as a high energy cosmic rays source
[OG-5.4-8] N85-34065
Anisotropy of cosmic rays above 10(14) eV
[OG-5.4-11] N85-34068
LOPEZ ENERGY ALTERNATIVES PROJECT, WASH.
Lopez Energy Alternatives Project
[DE85-010589] N85-33837
LOS ALAMOS NATIONAL LAB., N. MEX.
A method of accurizing rail guns
[LA-10028-MS] N85-33166
Method for fluorination of actinide fluorides and oxyfluorides using O2F2
[DE85-011646] N85-33202
Photofragment fluorescence as a sensitive probe for gas-phase alkali compounds and their photochemistry
[DE85-010707] N85-33219
Static high pressure study of nitric oxide chemistry: Proposed mechanism for nitric oxide detonation
[DE85-010795] N85-33220
Sodium nitrate containing mixture for producing ceramic-glass-ceramic seal by microwave heating
[DE85-011610] N85-33254
Conceptual design and analysis of high-speed electronic imaging
[LA-10072-MS] N85-33292
KRAK: A computer program for two-phase two-component porous flow and fracture
[LA-9703] N85-33434
Picosecond-pulse damage studies of diffraction gratings
[DE85-010785] N85-33481
Fuel cell applications literature review
[DE85-011891] N85-33592
Environmental surveillance at Los Alamos during 1984
[DE85-011886] N85-33605
QKPLT users guide, version 2.0
[L-10094-M] N85-33707
Determination of DTL configurations
[DE85-010714] N85-33719
Monte Carlo learning-biasing experiment with intelligent random numbers
[DE85-010713] N85-33742
Implicit Monte Carlo methods and non-equilibrium Marshak wave radiative transport
[DE85-010711] N85-33743
Proceedings of the 18th LAMPF Users Group Meeting
[DE85-011888] N85-33773
Nuclear data for MCNP
[DE85-010794] N85-33782
Accelerator vibration issues
[DE85-010766] N85-33791
Design status of heavy ion injector program
[DE85-010751] N85-33793
Electron trajectories in a combined wiggler and alternating gradient quadrupole field
[DE85-010727] N85-33794
Quark structure of nuclei
[DE85-010781] N85-33795
Statistical analyses in the study of solar wind-magnetosphere coupling
[DE85-009596] N85-33898
Soft-spectrum gamma-ray bursts
[OG-1.1-2] N85-33904
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network
[OG-1.2-1] N85-33912
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network
[OG-1.2-5] N85-33915
LOS ALAMOS SCIENTIFIC LAB., N. MEX.
Rapid analysis of steels using laser-based techniques
[DE85-010747] N85-33232
Sensitivity and performance characterization of DINGU
[DE85-010750] N85-33269
Pulsed hydrojet propulsion
[DE85-010771] N85-33446
Slideline verification for multilayer pressure vessels and piping analysis including strain hardening
[DE85-005816] N85-33549
KIVA computer program for multidimensional chemically reactive fluid flows with fuel sprays
[DE85-012730] N85-33722
The cw operation of the FMIT RFQ accelerator
[DE85-012667] N85-33757
Transverse emittance of a 2.0-MeV RFQ beam with high brightness
[DE85-012718] N85-33758
Rf program for LAMPF 2
[DE85-012693] N85-33760
Nuclear physics in the 10 to 300 MeV energy range using a pulsed white neutron source
[DE85-003713] N85-33775

Neutron detector counting capabilities for (10) B-lined and (235) U fission chambers in high gamma-ray fluxes
[DE85-011893] N85-33780
Long-term exposure of (238) PuO2 to a terrestrial environment, volume 3
[DE85-011896] N85-33781
Gamma-ray line intensities for depleted uranium
[DE85-012674] N85-33804

LOUISIANA STATE UNIV., BATON ROUGE.
Galactic propagation models consistent with the cosmic ray lifetime derived from Be-10 measurements
[OG-4.3-1] N85-34026
Implications of new measurements of O-16 + p + C-12,13, N-14,15 for the abundances of C, N isotopes at the cosmic ray source
[OG-4.3-2] N85-34027

LUNAR AND PLANETARY INST., HOUSTON, TEX.
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[NASA-CR-176093] N85-33849

M

MARTIN MARIETTA AEROSPACE, DENVER, COLO.
Space station automation study: Autonomous systems and assembly, volume 2
[NASA-CR-176092] N85-33175
The design and development of a spacecraft appendage tie down mechanism N85-33522
A dual, fault-tolerant aerospace actuator N85-33530

MARTIN MARIETTA ENERGY SYSTEMS, INC., OAK RIDGE, TENN.
Elmo bumpy square plasma confinement device
[DE85-011628] N85-33616

MARYLAND UNIV., COLLEGE PARK.
Computer science: Key to a space program renaissance. The 1981 NASA/ASEE summer study on the use of computer science and technology in NASA. Volume 2: Appendices
[NASA-CR-175295] N85-33702
A model for the UHE gamma-rays from Hercules X-1
[OG-2.2-8] N85-33934
The universal spectrum of AGNs and QSOs
[OG-2.7-9] N85-33982
Parametrized energy spectrum of cosmic-ray protons with kinetic energies down to 1 GeV
[OG-4.2-11] N85-34025
Composition of primary cosmic rays near the bend from a study of hadrons in air showers at sea level
[OG-5.2-2] N85-34059
The composition of cosmic rays near the Bend (10 to the 15th power eV) from a study of muons in air showers at sea level
[OG-5.2-3] N85-34060
Cosmic rays in the 10(16) to 10(19) eV range from pulsars
[OG-5.4-3] N85-34080
Interpretation of cosmic-ray anisotropy below 10(14) eV
[OG-5.4-13] N85-34090
Analysis of experimental data on interstellar antiprotons in the light of measurements of high-energy electrons and He-3 nuclei
[OG-6.1-6] N85-34097
Spectral shape variation of interstellar electrons at high energies
[OG-6.2-7] N85-34106

MASON AND HANGER-SILAS MASON CO., INC., AMARILLO, TEX.
Explosive containment study
[DE85-011719] N85-33267

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Thermal reactions of aromatics with CaO
[DE85-010688] N85-33193
Tensile fatigue of glass fibers and composites with conventional and surface compressed fibers
[RR-R84-4] N85-33196
Optimal Bayesian estimators for image segmentation and surface reconstruction
[AD-A155732] N85-33704
Analysis of Jovian decametric data: Study of radio emission mechanisms
[NASA-CR-176057] N85-33846

MASSACHUSETTS UNIV., AMHERST.
Oxidation states of iron in the terrestrial planets: Evidence and implications for accretion models N85-33854

MATERIALS RESEARCH LABS., MELBOURNE (AUSTRALIA).
Use of the computer programs PARA 80 to study results from firing the railgun ERGS-1M
[MRL-R-900] N85-33167

MATRA SERVICE AERODYNAMIQUE, LE CHESNAY (FRANCE).
Filament wound structures in PSP carbon composite
[RV10/84424] N85-33198

MAX-PLANCK-INST. FUER CHEMIE, MAINZ (WEST GERMANY).
Biological modulation of planetary atmospheres: The early Earth scenario N85-33867

MAX-PLANCK-INST. FUER EXTRATERRESTRISCHE PHYSIK, GARCHING (WEST GERMANY).
CEN A observation at MeV-energies
[OG-2.7-7] N85-33980
Multicomponent analysis of total COS-B gamma-ray data at intermediate lattitudes
[OG-3.1-3] N85-33991
Local electron spectrum above 100 MeV derived from gamma-ray emissivity spectra
[OG-3.1-7] N85-33995

MAX-PLANCK-INST. FUER PHYSIK UND ASTROPHYSIK, GARCHING (WEST GERMANY).
Investigations of the cyclotron resonance effects in the X ray spectrum of the neutron star Hercules X-1
[MPE-191] N85-34112

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Radio observations of four anticenter 2CG gamma-ray sources
[OG-2.5-10] N85-33965

MERIDIAN CORP., FALLS CHURCH, VA.
Federal export assistance programs applicable to the US photovoltaic industry
[NASA-CR-176114] N85-33841

MICHIGAN STATE UNIV., EAST LANSING.
Corrosion management strategies for aircraft and related systems N85-33239
Relating corrosion maintenance to environmental factors N85-33247

MICHIGAN UNIV., ANN ARBOR.
Multiparameter conditionally sampled laser velocimetry measurements during flame propagation in a spark ignition engine
[DE85-009850] N85-33502
Modeling and measurement of fault-tolerant multiprocessors
[NASA-CR-3920] N85-33732

MICROBIAL PRODUCTS, INC., FAIRFIELD, CALIF.
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658

MIDDLE EAST TECHNICAL UNIV., ANKARA (TURKEY).
Maintenance and the military environment N85-33243

MIDWEST RESEARCH INST., GOLDEN, COLO.
Solid-melt interface studies of high-speed silicon sheet growth
[NASA-CR-176112] N85-33249
Monosilane and disilane, 1984 report
[DE85-008776] N85-33262
Laser sealed evacuated window glazings
[DE85-000512] N85-33273
Method of bonding silver to glass and mirrors produced according to this method
[DE85-011642] N85-33495
Failure testing of active solar energy system components
[DE84-013024] N85-33561
An analysis of the effects of active solar energy system control sensor degradation on system performance
[DE84-013023] N85-33562
Stable n-CuInSe/sub 2/iodide-iodine photoelectrochemical cell
[DE85-011597] N85-33576
Photovoltaic energy systems
[DE85-011630] N85-33581
1985 Amorphous Silicon Review Meeting
[DE85-008794] N85-33582
Photovoltaics technical information guide
[DE85-002924] N85-33585
Advances in open-cycle solid desiccant cooling
[DE85-008797] N85-33590
Method and apparatus for measuring areas of photoelectric cells and photoelectric cell performance parameters
[DE85-011629] N85-33599
Salinity driven oceanographic upwelling
[DE85-011664] N85-33652
Production of liquid fuels and chemicals by microalgae
[DE85-008780] N85-33658

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Observation of an excess of cosmic ray muons of energies 2 TeV from the direction of Cygnus X-3
[OG-2.1-3] N85-33920

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Very low temperature studies of hyperfine effects in metals
[DE85-013367] N85-33236
Development of a microorifice uniform deposit cascade impactor
[DE85-006765] N85-33614
Generalized string amplitude and wave equation for hadrons
[DE85-011492] N85-33798
Noble gas patterns in the atmospheres of Mars and Earth: A comparison via the SNC meteorites N85-33853

MITRE CORP., BEDFORD, MASS.
Assured information flow capping architecture
[AD-A155392] N85-33283

MITRE CORP., MCLEAN, VA.
System safety study of minimum TCAS 2 for instrument weather conditions
[FAA/PM-85-12] N85-33113

MOBIL TYCO SOLAR ENERGY CORP., WALTHAM, MASS.
Stress and efficiency studies in EFG
[NASA-CR-176125] N85-33251

MORRISON-KNUDSEN ENGINEERS, INC., SAN FRANCISCO, CALIF.
Small-hydropower development: The process, pitfalls, and experience. Volume 1: Feasibility studies summary and analysis
[DE85-010839] N85-33589

MOSCOW STATE UNIV. (USSR).
Search for the gamma-ray fluxes with energies above 10915) eV from various objects
[OG-2.6-14] N85-33975
Charge composition and energy spectral of cosmic ray primary particles for energies higher than 1 TeV
[OG-4.1-14] N85-34020

MOUND LAB., MIAMISBURG, OHIO.
Nuclear magnetic resonance study of the intramolecular rearrangement of 2-(5-cyanotetrazolato)pentaammine cobalt (III) perchlorate
[DE85-010810] N85-33772
Neutron flux, spectrum and dose equivalent measurements for a 4500-W(th) 238 PuO2 general purpose heat source
[DE85-011361] N85-33786

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The sidereal anisotropy of cosmic rays around 3 x 10 (15) eV observed at a middle north latitude
[OG-5.3-6] N85-34072

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Synthesis of 2,4,8,10-tetroxaspiro5,5undecane
[NASA-CASE-ARC-11243-2] N85-33187

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, D. C.
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[NASA-SP-7037(189)] N85-33104
Discussion of the paper, Some Aspects of Propulsion for the Augmenter-Wing Concept, by D. C. Whittley
[NASA-TM-77884] N85-33108
Experimental investigations on airfoils with different geometries in the domain of high angles of attack-flow separation
[NASA-TM-77892] N85-33110
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[NASA-SP-7039(27)-SECTION-1] N85-33840

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Flutter clearance of the Schweizer 1-36 deep-stall sailplane
[NASA-TM-85917] N85-33118
Qualification needs for advanced integrated aircraft
[NASA-TM-86731] N85-33119
Development of a temperature-compensated hot-film anemometer system for boundary-layer transition detection on high-performance aircraft
[NASA-TM-86732] N85-33121
Development of control laws for a flight test maneuver autopilot for an F-15 aircraft
[NASA-TM-86736] N85-33122
Flight test experience and controlled impact of a large, four-engine, remotely piloted airplane
[NASA-TM-86738] N85-33123
Application of frequency domain handling qualities criteria to the longitudinal landing task
[NASA-TM-86728] N85-33124
A review of shock waves around aeroassisted orbital transfer vehicles
[NASA-TM-86769] N85-33177
Synthesis of 2,4,8,10-tetroxaspiro5,5undecane
[NASA-CASE-ARC-11243-2] N85-33187
Nineteenth Aerospace Mechanisms Symposium
[NASA-CP-2371] N85-33512
Man-vehicle systems research facility advanced aircraft flight simulator throttle mechanism N85-33527

Circulation control lift generation experiment: Hardware development N85-33535
Two-plane balance and slip-ring design N85-33536
A formulation and analysis of combat games [NASA-TP-2487] N85-33745
Climatic consequences of very high CO2 levels in Earth's early atmosphere N85-33865

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.
Crustal Dynamics Project: Catalogue of site information [NASA-TM-86218] N85-33552
Ninteenth International Cosmic Ray Conference. Conference program and author index [NASA-CP-2376] N85-33901
Ninteenth International Cosmic Ray Conference. OG sessions, volume 1 [NASA-CP-2376-VOL-1] N85-33902
Optical monitoring of gamma-ray source fields [OG-1.1-7] N85-33908
Search for infrared counterparts of gamma-ray bursters [OG-1.1-9] N85-33910
A second catalog of gamma ray bursts: 1978 - 1980 localizations from the interplanetary network [OG-1.2-1] N85-33912
Limits to the burster repetition rate as deduced from the 2nd catalog of the interplanetary network [OG-1.2-5] N85-33915
An internally consistent gamma ray burst time history phenomenology [OG-1.2-6] N85-33916
High-resolution spectroscopic observation of Vela X-1 in the hard X-ray energy range [OG-2.2-10] N85-33936
The universal spectrum of AGNs and QSOs [OG-2.7-9] N85-33982
The galactic gamma-ray distribution and the radial cosmic ray gradient [OG-3.1-4] N85-33992
Ninteenth International Cosmic Ray Conference. OG sessions, volume 2 [NASA-CP-2376-VOL-2] N85-34006
Measurement of the iron spectrum from 60 to 200 GeV per nucleon [OG-4.1-11] N85-34017
Cosmic ray nuclei of energy 50 GeV/NUC [OG-4.1-12] N85-34018
On the possibility of the determining the average mass composition near 10 to the 14th power eV through the solar magnetic field [OG-5.1-9] N85-34051
Energy dependence of cosmic ray composition above 10(15) GeV/nucleus [OG-5.4-4] N85-34081
Implications of the experimental results on high energy cosmic rays with regard to their origin [OG-5.4-5] N85-34082
Secondary antiproton production in relativistic plasmas [OG-6.1-4] N85-34095
Antiparticles in the extragalactic cosmic radiation [OG-6.1-8] N85-34099
Galactic cosmic ray antiprotons and supersymmetry [OG-6.1-9] N85-34100

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. JOHNSON (LYNDON B.) SPACE CENTER.
Testimony of Robert A. Frosch before the Subcommittee on HUD and Independent Agencies of the Senate Committee on Appropriations [NASA-TM-87496] N85-33173
Statement of Aaron Cohen, Director, Research and Engineering, Johnson Space Center and Chairman, Space Station Advanced Technology Advisory Committee, National Aeronautics and Space Administration, before the Subcommittee on Science, Technology, and Space, Committee on Commerce, Science, and Transportation, United States Senate [NASA-TM-87497] N85-33174
Telepresence work system concepts N85-33525
Spacelab 1 hematology experiment (INS103): Influence of space flight on erythrokinetics in man [NASA-TM-58268] N85-33693
Liquid crystal light valve structures [NASA-CASE-MSC-20036-1] N85-33826
Absolute rigidity spectrum of protons and helium nuclei above 10 GV/c [OG-4.1-1] N85-34007
Observation of cosmic ray positrons from 5 to 25 GeV [OG-6.2-5] N85-34104

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, HAMPTON, VA.
An image compression survey and algorithm switching based on scene activity [NASA-TP-2458] N85-33106
Aerodynamic characteristics of a distinct wing-body configuration at Mach 6: Experiment, theory, and the hypersonic isolation principle [NASA-TP-2467] N85-33107
Energy efficient transport technology: Program summary and bibliography [NASA-RF-1135] N85-33116
A survey of structural material issues for a space station [NASA-TM-86385] N85-33168
Deployable-erectable trade study for space station truss structures [NASA-TM-87573] N85-33181
A mixed pseudospectral/finite difference method for a thermally driven fluid in a nonuniform gravitational field [NASA-TM-87581] N85-33436
Hoop/column antenna deployment mechanism overview N85-33514
Development of an energy-absorbing passenger seat for a transport aircraft N85-33515
Joint design for improved fatigue life of diffusion-bonded box-stiffened panels [NASA-TP-2480] N85-33537
Selecting step sizes in sensitivity analysis by finite differences [NASA-TM-86382] N85-33538
Structural dynamics model and response of the deployable reference configuration space station [NASA-TM-86386] N85-33539

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.
Vortex generating flow passage design for increased film cooling effectiveness [NASA-CASE-LEW-14039-1] N85-33433
Local heat-transfer measurements on a large, scale-model turbine blade airfoil using a composite of a heater element and liquid crystals [NASA-TM-86900] N85-33435
Multistage spent particle collector and a method for making same [NASA-CASE-LEW-13914-1] N85-33489
Dual clearance squeeze film damper [NASA-CASE-LEW-13506-1] N85-33490
Application of traction drives as servo mechanisms N85-33520
Advances in sputtered and ion plated solid film lubrication N85-33524

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
Procedure for estimating orbital debris risks [NASA-TP-2507] N85-33169
Surface voltage gradient role in high voltage solar array-plasma interaction: Center Director's discretionary fund [NASA-TM-86516] N85-33567
Method of and apparatus for generating an interstitial point in a data stream having an even number of data points [NASA-CASE-MFS-25319-1] N85-33701
A measurement of the cosmic ray elements C to Fe in the two energy intervals 0.5-2.0 GeV/n and 20-60 GeV/n [OG-4.1-6] N85-34012
Primary cosmic ray spectra in the range 20-60 GeV/n [OG-4.1-9] N85-34015
Composition and energy spectra of cosmic ray nuclei above 500 GeV/nucleon from the JACEE emulsion chambers [OG-4.1-13] N85-34019

NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.
Thermophysical properties of fluids for the gas industry [PB85-198471] N85-33227

NATIONAL BUREAU OF STANDARDS, GAITHERSBURG, MD.
NBS (National Bureau of Standards) library serial holdings, 1985 [PB85-191948] N85-33839

NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLO.
Dynamics of Mesoscale Weather Systems: 1984 Summer Colloquium [PB85-188266] N85-33649
National Center for Atmospheric Research [PB85-191237] N85-33835

NATIONAL GEODETIC SURVEY, ROCKVILLE, MD.
Contrasts in evolution of Venus and Earth N85-33880

NATIONAL INST. VOOR KERNFYSICA EN HOGE ENERGIEYSICA, AMSTERDAM (NETHERLANDS).
Does low-energy physics depend on the potential of a heavy Higgs-particle [NIKHEF-H/85-1] N85-33763

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, BOULDER, COLO.
Radar wind profilers in the Colorado network [PB85-185486] N85-33647

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, WASHINGTON, D. C.
The space station polar platform: NOAA systems considerations and requirements [NOAA-TR-NESDIS-22] N85-33182
The use of TOMS data in evaluating and improving the total ozone from TOVS measurements [NOAA-TR-NESDIS-23] N85-33626

NATIONAL PHYSICAL LAB., TEDDINGTON (ENGLAND).
Long-term strength of glass fibre/phenolic resin composites [NPL-DMA(A)-98] N85-33195
Thermodynamic properties of alloys in the Fe-Ti system [NPL-DMA(A)-96] N85-33229
The Mk.1 NPL digital sampling ac wattmeter [NPL-DES-82] N85-33290
The measurement of high value resistances at the NPL [NPL-DES-81] N85-33291
The design, construction and operation of a large-area, high-temperature, thermal conductance apparatus [NPL-DMA(A)-84] N85-33455
A theoretical appraisal of the use of ground-plane microphones for aircraft noise measurements [NPL-AC-103] N85-33752

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C.
Interacting Boson approximation [DE85-003016] N85-33756

NATIONAL TRANSPORTATION SAFETY BOARD, WASHINGTON, D. C.
Aircraft accident report: World Airways Inc., Flight 30H, McDonnell Douglas DC-10-30CF, N113WA, Boston-Logan International Airport, Boston, Massachusetts, January 23, 1982 [PB85-910406] N85-33114

NATIONAL WEATHER SERVICE, WASHINGTON, D.C.
Monthly and seasonal weather outlook for April 1985, March 30, 1985, volume 39, no. 7 [PB85-183804] N85-33646

NAVAL AIR DEVELOPMENT CENTER, WARMINSTER, PA.
Protective systems and maintenance policies for marine environments N85-33245

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
A hierarchy of knowledge levels implemented in a rule-based production system to calculate bounds on the size of intersections and unions of simple sets [AD-A155291] N85-33836

NAVAL RESEARCH LAB., WASHINGTON, D. C.
Power density and threshold control strategies for radar track initiation [AD-A155357] N85-33282
Current enhancement in a conducting channel [AD-A155418] N85-33812
Recombination and ionization in a nitrogen plasma [AD-A155426] N85-33613
Gamma ray line production from cosmic ray spallation reactions N85-34005

NAVAL SURFACE WEAPONS CENTER, WHITE OAK, MD.
Safety characteristics of non-lithium battery systems [AD-A155733] N85-33574

NDT TECHNOLOGIES, INC., SOUTH WINDSOR, CONN.
Electromagnetic inspection of wire ropes using sensor arrays [AD-A155412] N85-33509

NEW HAMPSHIRE UNIV., DURHAM.
Cosmic ray charge and energy spectrum measurements using a new large area Cerenkov x dE/dx telescope [OG-4.1-5] N85-34011
Cosmic ray isotope measurements with a new Cerenkov X total energy telescope [OG-4.3-4] N85-34029

NEW MEXICO STATE UNIV., LAS CRUCES.
Results of a search for deuterium at 25-50 GC/c using a magnetic spectrometer [OG-4.2-4] N85-34024

NEW MEXICO UNIV., ALBUQUERQUE.
New calorimetric all-particle energy spectrum [OG-5.1-4] N85-34046

NEW YORK UNIV., NEW YORK.
Model projections of time-dependent response to increasing carbon dicoxide
[DE85-013326] N85-33641
NEWCASTLE-UPON-TYNE UNIV. (ENGLAND).
The non-hydrostatic figures of the terrestrial planets N85-33887
Magnetic field generation in the cores of terrestrial bodies N85-33894
NORTH DAKOTA UNIV., GRAND FORKS.
Size exclusion chromatography-low angle laser light scattering photometry of lignite macromolecules
[DE85-012017] N85-33215
NORTHWEST ECONOMIC ASSOCIATES, VANCOUVER, WASH.
Deficit irrigation feasibility study and demonstration project
[DE85-011531] N85-33555
NOTTINGHAM UNIV. (ENGLAND).
Muon content of gamma ray induced EAS from Cygnus X-3
[OG-2.1-4] N85-33921
The muon content of EAS as a function of primary energy
[OG-5.1-8] N85-34050
NOVA UNIV., DANIA, FLA.
Air-sea interaction with SSM/I and altimeter
[NASA-CR-176105] N85-33650

O

OAK RIDGE NATIONAL LAB., TENN.
Seventh Symposium on Biotechnology for Fuels and Chemicals: Program and abstracts
[DE85-011197] N85-33192
Dispersion toughened ceramic composites and method for making same
[DE85-011601] N85-33252
Metallic glass composition
[DE85-011594] N85-33253
Improved process for the preparation of fiber-reinforced ceramic composites by chemical vapor deposition
[DE85-011584] N85-33255
Precision linear ramp function generator
[DE85-011647] N85-33304
Capacitance measuring device
[DE85-011643] N85-33460
Machine intelligence for robotics applications
[DE85-011430] N85-33503
Electrolytic cell
[DE85-011598] N85-33578
Global environmental transport models for tritium
[DE85-011437] N85-33639
Carcinogenesis of nitrated toluenes and benzenes skin and lung tumor assays in mice
[AD-A155723] N85-33655
Legionnaires' disease bacteria in power plant cooling systems: Phase 2
[DE85-011546] N85-33695
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697
Data Base Workshop: Availability-Reliability Modeling
[DE85-011570] N85-33713
Parallel Cholesky factorization in message-passing multiprocessor environments
[DE85-012079] N85-33717
MORSE-CGA: A Monte Carlo radiation transport code with array geometry capability
[DE85-012063] N85-33718
Monte Carlo and discrete ordinates calculations of 14-MeV neturons streaming through a stainless-steel duct (L/D = 4.6): Comparison with experiment
[DE85-011423] N85-33776
Fusion facility siting considerations
[DE85-012894] N85-33805
Calculated neutron-induced cross sections for /sup 63,65/Cu/sup 58,60/Ni and (52) Cr from 1 to 20 MeV and comparisons with experiments
[DE85-011928] N85-33808
Assessment of magnetic field asymmetries in ELMO Bumpy square
[DE85-011905] N85-33819
Fusion Power Demonstration (FPD) maintenance and disassembly considerations
[DE85-011413] N85-33820
Digital characterization of particle tracks for microdosimetry
[DE85-012898] N85-33822
High-field launch electron cyclotron heating experiments in the ELMO Bumpy Torus
[DE85-012068] N85-33825
OESTERREICHISCHES FORSCHUNGSZENTRUM SEIBERSDORF G.M.B.H., VIENNA.
Prestressed concrete vessel according to the hot liner concept: A critical evaluation of experimental results with a prototype vessel
[OEFZS-4313] N85-33550
The degradation of pollutants in water and waste water by means of electron or gamma irradiation
[OEFZS-4317] N85-33615
Multiple collision solutions for time-dependent neutron transport in slabs of finite thickness
[OEFZS-4312] N85-33762
OHIO STATE UNIV., COLUMBUS.
Diffusion welding of Cassegrainian concentrator cell stack assemblies
[NASA-CR-176104] N85-33566
Application of nonlinear least squares methods to the analysis of solar spectra
[NASA-CR-176122] N85-33637
OKAYAMA UNIV. (JAPAN).
Arrival directions of large air showers, low-mu showers and old-age low-mu air showers observed at St. Chacaltaya
[OG-5.3-2] N85-34069
OREGON STATE UNIV., CORVALLIS.
Quarter-inch streaming tape drive application with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155354] N85-33295
DECODE: A software manual for use with the Serial ASCII Instrumentation Loop (SAIL) system
[AD-A155358] N85-33709
K(-) hydrogen bound and continuum states in momentum space
[DE85-010429] N85-33789
OSMANIA UNIV., HYDERABAD (INDIA).
Interrelationships among the terrestrial planets N85-33859

P

PACIFIC NORTHWEST LAB., RICHLAND, WASH.
Long-term research in Japan: Amorphous metals, metal oxide varistors, high-power semiconductors and superconducting generators
[DE85-010827] N85-33230
Fiber optic moisture sensor
[DE85-011651] N85-33462
Current internal-dosimetry practices at US Department of Energy facilities
[DE85-011718] N85-33466
Beta response of selected instruments
[DE85-013278] N85-33469
Photovoltaic industry progress through 1984
[DE85-013029] N85-33596
Long-term goals for solar thermal technology
[DE85-013032] N85-33597
MELSAR: A mesoscale air quality model for complex terrain. Volume 1: Overview, technical description and user's guide
[DE85-010943] N85-33608
Control technology for radioactive emissions to the atmosphere at US Department of Energy facilities: The Los Alamos Meson Physics Facility
[DE85-011402] N85-33609
Technology of off-gas treatment for liquid-fed ceramic melters
[DE85-012467] N85-33610
Organic solvent alteration of hydraulic properties of sedimentary rocks of low permeability: A review
[DE85-012537] N85-33635
Measurement of radionuclides in waste packages
[DE85-011674] N85-33766
Current regulatory and licensing status for byproduct sources, facilities and applications
[DE85-010967] N85-33796
Irradiation of northwest agricultural products
[DE85-012455] N85-33803
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
Experimental characterization and stability of salt- and nonsalt-containing grouts and mortars (BCT-1F- and BCT-1FF-related)
[DE85-012339] N85-33263
Use of low energy hydrogen ion implants in high efficiency crystalline silicon solar cells
[NASA-CR-176109] N85-33571
Anaerobic microbial transformations in subsurface environments
[DE85-012790] N85-33659
PENNSYLVANIA UNIV., PHILADELPHIA.
Experimental studies of the geometric and electronic structure of chemisorption bonding
[PB85-192250] N85-33228
PLANETARY SCIENCE INST., TUCSON, ARIZ.
Late-stage planetesimals: How big? N85-33857
Questions about Mercury's role in comparative planetary geophysics N85-33861
POLITECNICO DI TORINO (ITALY).
Expansion ratio influence on population inversion in CO2/Ar CW gasdynamic lasers operating at various transitions within coupled upsilon 1 and upsilon 2 modes of CO2
[STN-4] N85-33485
PRINCETON UNIV., N. J.
Method and apparatus for maintaining equilibrium in a helical axis stellarator
[DE85-011626] N85-33815
PURDUE UNIV., LAFAYETTE, IND.
Ink jet printing of silver metallization for photovoltaics
[NASA-CR-176054] N85-33569
Interacting Boson approximation
[DE85-003016] N85-33756

R

RE/SPEC, INC., RAPID CITY, S. DAK.
Design analysis for a repository in crystalline rock
[DE85-011802] N85-33771
RENSSELAER POLYTECHNIC INST., TROY, N. Y.
Deep-burial diagenesis in carbonates
[DE85-011224] N85-33554
RESEARCH INST. OF NATIONAL DEFENCE, LINKOEPING (SWEDEN).
Sensitivity of compressive receivers
[FOA-C-30385-E4] N85-33288
Hierarchical chamfer matching
[FOA-C-30387-E1] N85-33558
RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
SHELTER: Description of a program code
[FOA-C5-85-0002-H1] N85-33278
Hole cutting in building frames by laser
[FOA-C-20569-D9] N85-33487
RESEARCH INST. OF NATIONAL DEFENCE, UMEA (SWEDEN).
Nordic Association for Aerosol Research (NOSA) Aerosol Symposium: Program and abstracts
[FOA-E-40019] N85-33616
RESEARCH TRIANGLE INST., RESEARCH TRIANGLE PARK, N.C.
CARE 3 MENU maintenance manual
[NASA-CR-172609] N85-33708
RIKKYO UNIV., TOKYO (JAPAN).
Observations of ultraheavy cosmic ray particles at 10 GV cutoff rigidity
[OG-4.4-2] N85-34035
ROCKET RESEARCH CORP., REDMOND, WASH.
Voyager 0.2-lbf thruster valve assembly short pulse test report
[NASA-CR-176121] N85-33185
ROCKWELL INTERNATIONAL CORP., GOLDEN, COLO.
Non-bonded ultrasonic transducer
[DE85-011006] N85-33504
How a BASIC program works
[DE85-009142] N85-33727
ROCKWELL INTERNATIONAL CORP., RICHLAND, WASH.
Stochastic groundwater flow modeling using the second-order method
[DE85-011250] N85-33556
ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
Current requirements for the design and maintenance against corrosion of UK military aircraft N85-33244
ROYAL NETHERLANDS METEOROLOGICAL INST., DE BILT.
Verification of Doppler sodar measurements
[KNMI-WR-85-2] N85-33645
ROYAL SIGNALS AND RADAR ESTABLISHMENT, MALVERN (ENGLAND).
Precision microwave attenuation measurement by time interval ratio
[RSRE-85005] N85-33280
Performance of rolling ball and isometric joystick on a 2-D target alignment task
[RSRE-MEMO-3695] N85-33699

S

SACHS/FREEMAN ASSOCIATES, INC., BOWIE, MD.
Search for gamma ray lines from SS433
[OG-2.4-11] N85-33955
SAITAMA UNIV., URAWA (JAPAN).
High-energy multiple muons and heavy primary cosmic-rays
[OG-5.2-9] N85-34065

SANDIA LABS., ALBUQUERQUE, N. MEX.
Sandia Cooperative Group on the Aerothermochemistry of Turbulent Combustion. Discussion record of the second meeting
[DE85-007493] N85-33203
Second order modelling in non-constant density flows N85-33206
Turbulent mixing and combustion N85-33207
Simultaneous measurement of velocity and density in a turbulent nonpremixed flame N85-33209
Vortex dynamics simulation of conserved scalar dissipation N85-33210
Ionization detection of stimulated Raman spectra
[DE85-010672] N85-33218
Method for preparing Pb-(beta)-aluminum ceramic
[DE85-011665] N85-33256
Radiation-hardened polymeric films
[DE85-011636] N85-33259
Consortium program for the study of boron-rich borides
[DE85-011378] N85-33260
Experimental study of engine knock
[DE85-009651] N85-33268
Experimental studies of chemical reactivity during shock initiation of hexanitrostilbene
[DE85-011726] N85-33270
Modeling granular explosive detonations with shear band concepts
[DE85-011823] N85-33271
Vacuum interface flashover with bipolar electric fields
[DE85-012027] N85-33275
Magnetically insulated diode for generating pulsed neutron and gamma ray emissions
[DE85-011658] N85-33306
Model that predicts pulse charged gas switching breakdown phenomena
[DE85-013119] N85-33313
Preliminary considerations for the gasdynamic precompression of solid molecular hydrogen
[DE85-013256] N85-33445
Optical-fiber/microprocessor-based remote velocity sensor
[DE85-010071] N85-33470
Low temperature experimental capability for use with gas guns
[DE85-010418] N85-33548
The 1984 environmental monitoring report, Sandia National Laboratories, Albuquerque, New Mexico
[DE85-011175] N85-33607
A 1984 environmental summary: Sandia National Laboratories Tonopah Test Range, Tonopah, Nevada
[DE85-011145] N85-33612
Development of an adjustable buoyancy balloon tracer of atmospheric motion. Phase 1: Systems design and demonstration of feasibility
[PB85-185817] N85-33648
AUTSKED: An addendum
[DE85-010410] N85-33712
SANCHO: A finite element computer program for the quasistatic, large deformation, inelastic response of two-dimensional solids
[DE85-011456] N85-33714
Surface wave modes of a multilayered medium backed by a perfectly conducting ground plane: Computation of propagation constants
[DE85-011454] N85-33715
User commands for product design and system management
[DE85-011708] N85-33721
PMEXA: Diagnostic filtering program for the PBFA-1 performance monitoring and evaluation system
[DE85-013179] N85-33725
Experiments and improvements of the ordinary differential equation solvers DEPAC on the CRAY computer
[DE85-013260] N85-33726
Integration of office automation within computing
[DE85-010021] N85-33736
Supermite vacuum interface design
[DE85-012861] N85-33759
Reduction of reabsorption effects in scintillators by employing solutes with large Stokes shifts
[DE85-011645] N85-33767
Search for positron annihilation line and continuum radiation from the Galactic Center
[OG-2.5-5] N85-33962
Transient two-dimensional simulation of SEU in a CMOS SRAM cell
[DE85-008419] N85-34111

SANDIA LABS., LIVERMORE, CALIF.
Properties of Ti-6Al-4V spun formed fuze supports
[DE85-011968] N85-33498
Study of alternative system conversions for the Solar One pilot plant
[DE85-010026] N85-33594
IGES/RIM Parser/Converter users guide
[DE85-011965] N85-33716

SCIENCE APPLICATIONS, INC., LAS VEGAS, NEV.
Tectonic stability and expected ground motion at Yucca Mountain
[DE85-012004] N85-33629

SCIENCE APPLICATIONS RESEARCH, LANHAM, MD.
A strategy planner for NASA robotics applications
[NASA-CR-175319] N85-33738

SCIENTIFIC RESEARCH ASSOCIATES, INC., GLASTONBURY, CONN.
Calculation of steady and unsteady airfoil flow fields via the Navier-Stokes equations
[NASA-CR-3899] N85-33105
On the application of a hairpin vortex model of wall turbulence to trailing edge noise prediction
[NASA-CR-177938] N85-33109

SEASPACE, SAN DIEGO, CALIF.
Large-scale sea surface temperature variability from satellite and shipboard measurements
[NASA-CR-176123] N85-33651

SEMIX, INC., GAITHERSBURG, MD.
Investigation of the microstructure and photovoltaic properties of semicrystalline silicon N85-33573

SEREDA (P. J.), OTTAWA (ONTARIO).
Environmental factors in corrosion and deterioration of materials N85-33241

SHEFFIELD UNIV. (ENGLAND).
Harold Hazen and the theory and design of servomechanism
[RR-270] N85-33506

SMITHSONIAN ASTROPHYSICAL OBSERVATORY, CAMBRIDGE, MASS.
The design, development, testing, fabrication, calibration and integration of a High Resolution Imager (HRI) for the Roentgen Satellite (ROSAT)
[NASA-CR-175302] N85-33184
Determination of band oscillator strengths of atmospheric molecules from high resolution vacuum ultraviolet cross section measurements
[NASA-CR-176150] N85-33624

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, CANNES (FRANCE).
Study and realization of a command system adapted to space robotics
[SNIAS-851-440-106] N85-33183
Evaluation study of mechanical refrigeration systems for application to space missions
[SNIAS-1029ACA/LL/V] N85-33277

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, PARIS (FRANCE).
New materials needs in aeronautics
[SNIAS-851-502-101] N85-33120

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, SAINT-MEDARD-EN-JALLES (FRANCE).
Utilization of microwave measuring systems for the automation of composite materials manufacturing
[SNIAS-851-430-102] N85-33197

SOCIETE NATIONALE INDUSTRIELLE AEROSPATIALE, SURESNES (FRANCE).
Study of an ultrasonic detection method to inspect bonding effects in light alloy bonded structures, test report no. 43-954/F
[PV-43-954/F] N85-33510

SOLAREX CORP., ROCKVILLE, MD.
An enhanced photoresponse at dislocation subgrain boundaries revealed by X-ray topography of polysilicon solar cells N85-33572

SOUTH CAROLINA UNIV., COLUMBIA.
Evidence for a dynamical halo around the edge-on galaxy NGC 4631
[OG-6.2-1] N85-34102

SOUTHAMPTON UNIV. (ENGLAND).
Limits on the Doppler factor in relativistic jets by means of gamma-ray observations
[OG-2.7-12] N85-33985

SOUTHERN CALIFORNIA GAS CO., LOS ANGELES.
Heat-mass flow enhancement system for a metal hydride assembly
[DE85-010698] N85-33441

SOUTHWEST RESEARCH INST., SAN ANTONIO, TEX.
Development of a prototype energy meter
[PB85-196430] N85-33476

SPAR AEROSPACE LTD., STE-ANNE-DE-BELLEVUE (QUEBEC).
Design and development of a linear thermal actuator N85-33518

SPAR AEROSPACE LTD., TORONTO (ONTARIO).
The design and development of a constant-speed solar array drive N85-33519

SPERRY CORP., PHOENIX, ARIZ.
A rotating electrical transfer device N85-33529

SPIRE CORP., BEDFORD, MASS.
Block 5 documentation and solar modules
[NASA-CR-176134] N85-33564

SRI INTERNATIONAL CORP., MENLO PARK, CALIF.
Research on distributed artificial intelligence
[AD-A155356] N85-33733

STANFORD LINEAR ACCELERATOR CENTER, CALIF.
Lasertron simulation with a two-gap output cavity
[DE85-011213] N85-33480
Portable database driven control system for SPEAR
[DE85-010465] N85-33720
Iris tilting and RF steering in the SLAC Linac
[DE85-011704] N85-33783
New formulation for linear accelerator design
[DE85-011171] N85-33792

STANFORD UNIV., CALIF.
Space robot simulator vehicle
[NASA-CR-176133] N85-33176
Linear boundary detection using pressure buildup tests
[DE85-009926] N85-33444
A real time index of geomagnetic background noise for the MAD (Magnetic Anomaly Detection) frequency band
[AD-A155717] N85-33627
Model building and practical aspects of nonlinear programming
[AD-A155720] N85-33711

STUTTGART UNIV. (WEST GERMANY).
Welding methods for high melting metals N85-33508

SUNSTRAND ENERGY SYSTEMS, ROCKFORD, ILL.
Design of a dual fault tolerant space shuttle payload deployment actuator N85-33531

SUNTECH, INC., MARCUS HOOK, PA.
Method for removing chlorine compounds from hydrocarbon mixtures
[DE85-011608] N85-33191

SYDNEY UNIV. (AUSTRALIA).
Nonequilibrium chemistry in an isothermal turbulent flow N85-33211

SYRACUSE UNIV., N. Y.
Preparation and use of very pure c-D2
[DE85-009415] N85-33800

SYSTEMS APPLICATIONS, INC., SAN RAFAEL, CALIF.
Evaluation of the 2DFLOW and hybrid complex-terrain dispersion models with the 1980 ASCOT data base from the Geysers
[DE85-012960] N85-33613
Development of a chemical kinetic mechanism for the US EPA (Environmental Protection Agency) regional oxidant model
[PB85-185858] N85-33618
Modeling of auto exhaust smog chamber data for EKMA development
[PB85-186492] N85-33619

SYSTEMS SCIENCE AND SOFTWARE, LA JOLLA, CALIF.
WIPP horizon in situ permeability measurements
[DE85-012687] N85-33557

T

TATA INST. OF FUNDAMENTAL RESEARCH, BOMBAY (INDIA).
Search for gamma rays of energy 10(15) eV from Cygnus X-3
[OG-2.1-1] N85-33919
Microburst of TeV gamma rays from the Crab pulsar
[OG-2.3-4] N85-33941
Secondary periodicities of microbursts of TeV gamma rays from the Crab pulsar
[OG-2.3-5] N85-33942
Pulsed emission of TeV gamma rays from Vela pulsar N85-33947
Observations on TeV gamma rays from Geminga and PSR 0950+08
[OG-2.4-6] N85-33953
Spectral evolution of gamma-rays from adiabatically expanding sources in dense clouds
[OG-2.5-2] N85-33959
Supernova explosion in dense clouds in the galaxy and the COS-B gamma-ray sources
[OG-2.5-3] N85-33960
Balloon observations of hard X-rays from some galactic X-ray sources
[OG-2.5-11] N85-33966
A search for sources of ultra high energy gamma rays at air shower energies with Ooty EAS array
[OG-2.6-8] N85-33970
Search for TeV gamma rays from extragalactic sources and the Galactic Center
[OG-2.7-1] N85-33976
Balloon observations of hard X-rays from NGC 4151 and an X-ray transient source
[OG-2.7-6] N85-33979
Gamma-radiation with E gamma 5 MeV detected from Seyfert galaxy 3C120 and region with 1' = 190 deg and b' = 20 deg
[OG-2.8-8] N85-33981

Relative abundances of sub-iron to iron nuclei in low energy (50-250 MeV/N) cosmic rays as observed in the Skylab experiment
[OG-4.1-4] N85-34010
Composition of primary cosmic rays near the knee
[OG-5.2-10] N85-34066
Abundance of low energy (50-150 MeV) antiprotons in cosmic rays
[OG-6.1-1] N85-34092
Observed antiprotons and energy dependent confinement of cosmic rays: A conflict?
[OG-6.1-7] N85-34098
Halo of NGC 4631 and models of cosmic-ray transport
[OG-6.2-3] N85-34103
Electrons and positrons from expanding supernova envelopes in dense clouds
[OG-6.2-9] N85-34108

TECHNICAL RESEARCH CENTRE OF FINLAND, ESPOO.
Reactor pressure vessel steels ASME SA533B and SA508 C 1.2
[VTT-340] N85-33507
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551

TECHNISCHE HOCHSCHULE, AACHEN (WEST GERMANY).
Mechanical properties of Shielded Metal Arc (SMA) and Submerged Arc (SA) welded joints in a steel Raex 386 P Arctic
[VTT-339] N85-33551

TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
Theoretical aspects of corrosion and practical implications for aircraft and related systems N85-33240

TECHNISCHE HOGESCHOOL, TWENTE (NETHERLANDS).
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843

TECHNISCHE UNIV., CLAUSTHAL-ZELLERFELD (WEST GERMANY).
Permafrost features on Earth and Mars: Similarities, differences N85-33870

TENNESSEE UNIV., OAK RIDGE.
Three-dimensional reconstruction and data display of chromosome structure studied by electron microscope tomography
[DE85-011562] N85-33697

TEXAS A&M UNIV., COLLEGE STATION.
Far travelers: The exploring machines
[NASA-SP-480] N85-33126
Subduction zone tectonic studies to develop concepts for the occurrence of sediment subduction
[DE85-011794] N85-33632
Planetary reorientation by surface loads N85-33886

TEXAS UNIV., AUSTIN.
A substructure coupling procedure applicable to general linear time-invariant dynamic systems
[NASA-CR-176144] N85-33542
Substructure coupling in the frequency domain
[NASA-CR-176140] N85-33543
Multishaker modal testing
[NASA-CR-176139] N85-33544
A modal parameter extraction procedure applicable to linear time-invariant dynamic systems
[NASA-CR-176120] N85-33747
Collisional transport for a superthermal ion species in a plasma
[DE85-011943] N85-33818

TOKYO UNIV. (JAPAN).
The development of staging mechanisms for the Japanese satellite launcher Mu-3SII N85-33528
Terrestrial Xe isotopic contraints on the early history of the Earth N85-33852
Origin of the atmosphere and hydrosphere of the terrestrial planets N85-33863
Relationships between log N-log S and celestial distribution of gamma-ray bursts
[OG-1.2-10] N85-33918
A simulation of high energy cosmic ray propagation 1
[OG-5.4-1] N85-34078
A simulation of high energy cosmic ray propagation 2
[OG-5.4-2] N85-34079

TOKYO UNIV., TANASHI (JAPAN).
Gamma rays of energy or = 10(15) eV from Cyg X-3
[OG-2.1-5] N85-33922
Energy spectrum and arrival direction of primary cosmic rays of energy above 10 to the 18th power eV
[OG-5.1-1] N85-34043
A new method to determine the chemical composition of the cosmic rays beyond 10 to the 15th power eV
[OG-5.1-11] N85-34052
Cosmic ray composition between 10 to the 15th power - 10 to the 17th power eV obtained by air shower experiments
[OG-5.1-12] N85-34053
Anisotropy of cosmic rays of energy 10 (15) eV to 10 (17) eV observed at Akeno
[OG-5.3-3] N85-34070

TOLEDO UNIV., OHIO.
Aerodynamic analysis of a horizontal axis wind turbine by use of helical vortex theory, volume 2: Computer program users manual
[NASA-CR-174921] N85-33563

TRANSMISSION RESEARCH, INC., CLEVELAND, OHIO.
Rolling, slip and traction measurements on low modulus materials
[NASA-CR-174909] N85-33491

TRINITY UNIV., SAN ANTONIO, TEX.
Solar energy meteorological research and training program: Region 4
[DE85-011783] N85-33640

TUFTS UNIV., MEDFORD, MASS.
Simultaneous Solar Maximum Mission and Very Large Array (VLA) observations of solar active regions
[NASA-CR-176090] N85-33897

TUSKEGEE INST., ALA.
Use of gamma radiation as a form of preservation of sweet potatoes
[DE85-011998] N85-33787

U

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL (ENGLAND).
Effects of space radiation on advanced semiconductor devices. Part 3: Further cosmic ray simulation studies of single event upsets and latch-up in CMOS memories
[AERE-G-3368-PT-3] N85-33833

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, RISLEY (ENGLAND).
The properties of thin-section, four-point-contact ball bearings in space N85-33521

UNITED TECHNOLOGIES CORP., SOUTH WINDSOR, CONN.
Molten carbonate fuel cell separator
[DE85-011615] N85-33577

UNIVERSITY COLL., DUBLIN (IRELAND).
Variability in the high energy gamma ray emission from Cyg X-3 over a two-year period (1983 - 1984) at E 4 x 10(11) eV
[OG-2.1-11] N85-33927
Hercules X-1: Pulsed gamma-rays detected above 150 GeV
[OG-2.2-9] N85-33935
Observations of the Crab Nebula at energies 4.10(11)
[OG-2.3-1] N85-33938
Search for gamma-rays above 400 GeV from Geminga
[OG-2.4-4] N85-33951
Search for gamma-rays from M31 and other extragalactic objects
[OG-2.7-3] N85-33977

UTAH UNIV., SALT LAKE CITY.
Indications of mineral zoning in a fossil hydrothermal system at the Meager Creek geothermal prospect, British Columbia, Canada from induced polarization studies
[DE85-011962] N85-33636
500 TeV gamma rays from Hercules X-1
[OG-2.2-7] N85-33933
All sky Northern Hemisphere 10(15) EV gamma-ray survey
[OG-2.6-3] N85-33968
Ultra high energy cosmic ray spectrum
[OG-5.1-2] N85-34044
Study of composition of cosmic rays with energy .7 E 3 Ee
[OG-5.1-7] N85-34049
Arrival directions of cosmic rays of E .4 EeV
[OG-5.3-4] N85-34071
Modeling cosmic ray anisotropies near 10(18) eV
[OG-5.4-9] N85-34086

UTSUNOMIYA UNIV. (JAPAN).
Energy spectrum of cosmic-ray iron nucleus observed with emulsion chamber
[OG-4.1-10] N85-34016

V

VAN DER MEER EN VAN TILBURG, INNOVATIE ADVIESBURO, ENSCHEDE (NETHERLANDS).
New innovative businesses from industry. Experiences in the Netherlands in the successful transfer of technology from university to industry N85-33843

VARIAN ASSOCIATES, PALO ALTO, CALIF.
Low-cost high-performance silicon concentrator cells
[DE85-008875] N85-33584

VERMONT STATE AGENCY OF ENVIRONMENTAL CONSERVATION, MONTPELIER.
Bedrock geology of the Brattleboro Quadrangle, Vermont-New Hampshire
[DE85-011027] N85-33634

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Evaluation of semiconductor devices for Electric and Hybrid Vehicle (EHV) ac-drive applications, volume 2
[NASA-CR-176103] N85-33294
Stresses and deformations in cross-ply composite tubes subjected to a uniform temperature change: Elasticity and Approximate Solutions
[NASA-CR-176147] N85-33545
Nonlinear response and failure characteristics of internally pressurized composite cylindrical panels
[NASA-CR-176148] N85-33546
The stress distribution in pin-loaded orthotropic plates
[NASA-CR-176146] N85-33547

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS).
Interrelations for the elements of the scattering matrix N85-33872

W

WASHINGTON UNIV., SEATTLE.
X-ray spectroscopy of solids under pressure
[DE85-011486] N85-33213
Cryogenic system for the University of Washington Superconducting Booster
[DE85-010604] N85-33274
Confinement and heating of high beta plasma with emphasis on compact toroids. Compact toroid research
[DE85-011463] N85-33821

WASHINGTON UNIV., ST. LOUIS, MO.
Relative abundances of elements (20 or = Z or = 28) at energies up to 70 GeV/amu using relativistic rise in ion chambers
[OG-4.1-7] N85-34013
Energy spectra of elements with 18 or = Z or = 28 between 10 and 300 GeV/amu
[OG-4.1-8] N85-34014
Abundances of secondary elements among the ultra heavy cosmic rays: Results from HEAO-3
[OG-4.4-6] N85-34039

WESTFAELISCHE WILHELMS UNIV., MUENSTER (WEST GERMANY).
Models of planetary structure and evolution: The case of Io N85-33874
Adiabatic thermal models for planetary bodies N85-33881

WESTINGHOUSE ELECTRIC CORP., BALTIMORE, MD.
High-power solid-state rf source for accelerator cavities
[DE85-012672] N85-33309

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Mechanical connection for a tubular assembly
[DE85-011590] N85-33497

WESTINGHOUSE ELECTRIC CORP., WEST MIFFLIN, PA.
The 1984 effluent and environmental monitoring report for the Bettis Atomic Power Laboratory
[DE85-011533] N85-33602

WESTINGHOUSE HANFORD CO., RICHLAND, WASH.
Latch assembly
[DE85-011660] N85-33492

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER, PITTSBURGH, PA.
Laser-assisted solar cell metallization processing
[NASA-CR-176124] N85-33565
Development of high-efficiency solar cells on silicon web
[NASA-CR-176101] N85-33568

WHEELABRATOR-FRYE, INC., PITTSBURGH, PA.
Evaluation of pilot ESP used with a spray dryer FGD system at Pittsburgh Energy Technology Center, Bruceton, Pennsylvania
[DE85-011151] N85-33217

WINSMITH, SPRINGVILLE, N.Y.
Department of Energy gear drive unit final prototype testing and design evaluation
[DE85-003296] N85-33499

WISCONSIN UNIV., MADISON.
Finite element methods for viscoelastic flow
[AD-A154877] N85-33437

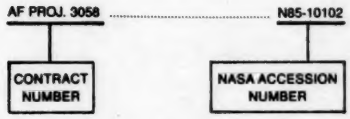
WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND).
The 2nd World Meteorological Association Regional Association (Asia), 8th session
[WMO-642] N85-33643
Meteorology and Society: Statements presented at the 9th congress under agenda item 12
[WMO-643] N85-33644

Z

ZHENGZHOU UNIV. (CHINA).
Observation of arrival times of EAS with energies or = 6 x 10 (14) eV
[OG-5.3-8] N85-34074

CONTRACT NUMBER INDEX

Typical Contract Number Index Listing



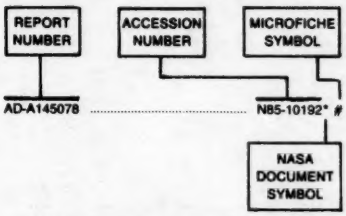
Listings in this index are arranged alphanumerically by contract number. Under each contract number the NASA accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order. The NASA accession number denotes the number by which the citation is identified.

AC03-76SF-00515 ..... N85-33480
N85-33783
ARPA ORDER 4395 ..... N85-33812
BMVG-T/R-760/C-0002/C-1702 ..... N85-33731
BMVG-T/R-760/C-0009/C-1709 ..... N85-33486
BMVG-T/R-760E-0007/E1707 ..... N85-33452
DA PROJ. 3E6-1102-BS-08 ..... N85-33655
DAAG29-80-C-0041 ..... N85-33437
DAAG29-84-K-0005 ..... N85-33704
DAAG29-84-K-0156 ..... N85-33711
DACW72-84-C-0013 ..... N85-33703
DAJA37-82-C-0058 ..... N85-33734
DE-AC01-78ET-11041 ..... N85-33191
DE-AC01-84NE-32123 ..... N85-33807
DE-AC01-84PE-17056 ..... N85-33276
DE-AC02-76CH-00016 ..... N85-33258
N85-33441
N85-33657
N85-33659
N85-33696
N85-33755
N85-33761
N85-33765
N85-33770
N85-33777
N85-33778
N85-33788
N85-33799
DE-AC02-76CH-03073 ..... N85-33814
N85-33815
DE-AC02-76ER-02383 ..... N85-33740
DE-AC02-78ER-04693 ..... N85-33580
DE-AC02-80ER-10753 ..... N85-33900
DE-AC02-80ER-10774 ..... N85-33935
N85-33977
DE-AC02-81ER-10921 ..... N85-33554
DE-AC02-81EV-10610 ..... N85-33641
DE-AC02-82ER-40063 ..... N85-33935
N85-33977
DE-AC02-83CH-10093 ..... N85-33249
N85-33262
N85-33273
N85-33302
N85-33305
N85-33494
N85-33495
N85-33561
N85-33562
N85-33576
N85-33581
N85-33582
N85-33585
N85-33590
N85-33652
N85-33658
DE-AC02-83CH-10139 ..... N85-33771
DE-AC02-83CH-10140 ..... N85-33263
DE-AC02-83ER-40105 ..... N85-33798
DE-AC03-76SF-00098 ..... N85-33266
N85-33303
N85-33308
N85-33587
N85-33598
N85-33628
N85-33630
N85-33764
N85-33779
DE-AC03-76SF-00515 ..... N85-33720
N85-33792
DE-AC03-83ER-40103 ..... N85-33935
N85-33977
DE-AC03-84SF-12194 ..... N85-33633
DE-AC03-84SF-12196 ..... N85-33636
DE-AC04-76DP-00053 ..... N85-33786
DE-AC04-76DP-00487 ..... N85-33267
DE-AC04-76DP-00613 ..... N85-33467
N85-33604
DE-AC04-76DP-00789 ..... N85-33115
N85-33203
N85-33218
N85-33256
N85-33259
N85-33260
N85-33270
N85-33271
N85-33275
N85-33306
N85-33313
N85-33445
N85-33470
N85-33548
N85-33557
N85-33584
N85-33607
N85-33612
N85-33712
N85-33714
N85-33715
N85-33721
N85-33725
N85-33726
N85-33736
N85-33759
N85-33767
N85-34111
DE-AC04-76DP-03533 ..... N85-33504
DE-AC04-76DP-000453 ..... N85-33772
DE-AC04-76DR-00789 ..... N85-33268
N85-33468
N85-33498
N85-33502
N85-33579
N85-33594
N85-33716
DE-AC05-76CR-00033 ..... N85-33656
DE-AC05-76OR-00001 ..... N85-33505
DE-AC05-84CR-21400 ..... N85-33252
N85-33639
DE-AC05-84CT-21400 ..... N85-33264
DE-AC05-84OR-21400 ..... N85-33192
N85-33231
N85-33253
N85-33255
N85-33304
N85-33460
N85-33479
N85-33503
N85-33526
N85-33578
N85-33695
N85-33697
N85-33713
N85-33717
N85-33718
N85-33770
N85-33776
N85-33805
N85-33808
N85-33816
N85-33819
N85-33820
N85-33822
N85-33825
DE-AC05-840R-21400 ..... N85-33463
DE-AC06-76FF-02170 ..... N85-33492
N85-33496
N85-33497
DE-AC06-76RL-01830 ..... N85-33230
N85-33462
N85-33469
N85-33596
N85-33597
N85-33608
N85-33609
N85-33610
N85-33635
N85-33766
N85-33803
DE-AC06-77RL-01030 ..... N85-33556
DE-AC06-78RL-01830 ..... N85-33466
DE-AC06-84ER-40124 ..... N85-33274
DE-AC07-76GJ-01664 ..... N85-33785
DE-AC07-76ID-01570 ..... N85-33234
N85-33439
DE-AC07-82ID-12254 ..... N85-33589
DE-AC08-82DP-40152 ..... N85-33729
DE-AC08-83NV-10270 ..... N85-33629
DE-AC08-83NV-10282 ..... N85-33237
N85-33638
DE-AC08-84NV-10322 ..... N85-33631
DE-AC09-76SR-00001 ..... N85-33235
N85-33500
N85-33802
DE-AC11-76PN-00014 ..... N85-33602
N85-33728
DE-AC21-79ET-15440 ..... N85-33311
N85-33577
DE-AC21-83MC-20212 ..... N85-33586
DE-AC21-83MC-20213 ..... N85-33632
DE-AC79-84EP-15109 ..... N85-33555
DE-AI01-76ET-20320 ..... N85-33563
DE-AI03-81SF-11578 ..... N85-33593
DE-AM03-76F-00326 ..... N85-33711
DE-AS03-84ER-52105 ..... N85-33817
DE-AS05-76ER-05126 ..... N85-33756
DE-AS05-81ER-10977 ..... N85-33737
DE-AS07-80ID-12082 ..... N85-33611
DE-AT03-76ER-72018 ..... N85-33711
DE-AT03-80SF-11459 ..... N85-33444
DE-AT06-72ET-53047 ..... N85-33821
DE-AT06-79ER-10405 ..... N85-33789
DE-FC01-80ET-23197 ..... N85-33572
DE-FC04-80CS-30602 ..... N85-33499
DE-FC07-80ED-12121 ..... N85-33595
DE-FC21-83FE-60181 ..... N85-33215
DE-FC22-83PC-61503 ..... N85-33217
DE-FG02-81WM-46642 ..... N85-33634
DE-FG02-84CH-10211 ..... N85-33787
DE-FG02-84ER-45056 ..... N85-33482
DE-FG02-84ER-45110 ..... N85-33261
DE-FG02-84ER-45142 ..... N85-33236
DE-FG02-84ER-53179 ..... N85-33800
DE-FG05-77ET-20152 ..... N85-33640
DE-FG05-80ET-3068 ..... N85-33818
DE-FG05-84ER-40147 ..... N85-34027
DE-FG06-80RO-00498 ..... N85-33837
DE-FG06-84ER-45163 ..... N85-33213
DE-FG22-80PC-30229 ..... N85-33193
DE-FG22-83PC-60807 ..... N85-33221
DE-FG22-83PC-61255 ..... N85-33614
DE-FG48-81R8-01066 ..... N85-33583
DEN3-35 ..... N85-33491
DE85-AC02-83CH-10093 ..... N85-33829
DOE-IAG-40-1016-79 ..... N85-33655
DPA-68-02-3735 ..... N85-33619
DRET-81-34-234-00-470-75-01 ..... N85-33198
DRET-81-529 ..... N85-33224
N85-33225
DRET-81/529 ..... N85-33223
DTFA01-83-C-20033 ..... N85-33700
DTFA01-84-C-00001 ..... N85-33113
DTFH68-83-P-70115 ..... N85-33838
EG-77-C-01-4042 ..... N85-33273
EPA-68-02-3169 ..... N85-33620
EPA-68-02-3738 ..... N85-33618
EPRI PROJ. 1745-15 ..... N85-33589
ESTEC-4963/81/NL-MS N85-33833

ESTEC-5629/83/NL-PB(SC) N85-33277
F19628-84-C-0001 ..... N85-33283
F19628-84-C-0115 ..... N85-33297
F33615-81-C-1524 ..... N85-33710
F33615-81-C-5065 ..... N85-33827
F33615-82-K-0600 ..... N85-33654
F33615-83-C-3603 ..... N85-33125
F49620-83-K-0021 ..... N85-33296
JPL PROJ. 9950-1074 ..... N85-33250
JPL PROJ. 9950-1075 ..... N85-33248
JPL PROJ. 9950-1082 ..... N85-33186
JPL PROJ. 9950-1141 ..... N85-33185
JPL PROJ. 9950-1146 ..... N85-33568
JPL PROJ. 9950-1169 ..... N85-33637
JPL-956396 ..... N85-33186
JPL-956403 ..... N85-33250
JPL-956460 ..... N85-33248
JPL-956786 ..... N85-33568
JPL-956928 ..... N85-33637
JPL-957031 ..... N85-33569
JPL-957181 ..... N85-33185
NAGW-373 ..... N85-33846
NAGW-550 ..... N85-34026
NAG1-296 ..... N85-33732
NAG1-343 ..... N85-33545
N85-33547
NAG1-492 ..... N85-33732
NAG3-448 ..... N85-33566
NAG5-306 ..... N85-34028
N85-34030
NAG5-484 ..... N85-33624
NAG5-501 ..... N85-33897
NAG8-448 ..... N85-34039
NAG8-498 ..... N85-34038
N85-34039
NAG8-499 ..... N85-33963
N85-34000
NAG8-500 ..... N85-34038
N85-34039
NAG8-502 ..... N85-34038
N85-34039
NAS-23940 ..... N85-33540
NASA ORDER A-47981-B N85-33912
NASA ORDER L-65611B N85-33125
NASA ORDER S-14513-D N85-33955
N85-34001
NASW-3369 ..... N85-33849
NASW-3557 ..... N85-33126
NASW-3688 ..... N85-33456
NASW-3722 ..... N85-33184
NASW-3805 ..... N85-33625
NASW-3966 ..... N85-33848
NAS1-15214 ..... N85-33105
NAS1-16489 ..... N85-33708
NAS1-17249 ..... N85-33109
NAS2-4006 ..... N85-33110
NAS2-11548 ..... N85-33111
NAS3-23253 ..... N85-33293
NAS3-23940 ..... N85-33541
NAS5-20995 ..... N85-34028
N85-34030
NAS5-22307 ..... N85-33912
NAS5-25182 ..... N85-33170
N85-33171
NAS5-25731 ..... N85-34026
NAS5-25980 ..... N85-33904
NAS5-26680 ..... N85-34022
NAS5-28200 ..... N85-33738
NAS5-28441 ..... N85-34023
NAS5-28442 ..... N85-34021
NAS5-28449 ..... N85-34023
NAS5-28609 ..... N85-33955
N85-34001
NAS7-100 ..... N85-33176
N85-33248
N85-33250
N85-33294
N85-33570
NAS7-918 ..... N85-33179
N85-33180
N85-33186
NAS8-498 ..... N85-34014
NAS8-500 ..... N85-34014
NAS8-502 ..... N85-34014
NAS8-27974 ..... N85-33903
NAS8-35042 ..... N85-33175
NAS8-35336 ..... N85-33542
N85-33543
N85-33544
N85-33747
NAS8-36081 ..... N85-33903
NCC-3-5 ..... N85-33563
NCC1-15 ..... N85-33546
NGL-14-001-005 ..... N85-34022
NGL-14-001-006 ..... N85-34021
N85-34026
NGR-05-002-160 ..... N85-34014
N85-34023
N85-34038
N85-34039
NGR-05-003-513 ..... N85-34027
NGR-05-006-160 ..... N85-34033
NGR-05-008-022 ..... N85-33945
NGR-15-003-118 ..... N85-33189
NGR-24-005-050 ..... N85-34014
N85-34038
N85-34039
NGR-26-008-001 ..... N85-34038
N85-34039
NGR-26-008-0001 ..... N85-34014
NGR-30-002-052 ..... N85-34011
N85-34029
NGR-267-008-001 ..... N85-34013
NGT-23-005-801 ..... N85-33732
NSF AST-83-17755 ..... N85-33934
NSF MCS-79-03542 ..... N85-33437
NSF MCS-81-02089 ..... N85-33437
NSF MCS-82-07496 ..... N85-33706
NSF MCS-83-01433 ..... N85-33437
NSF PHY-82-01089 ..... N85-33933
N85-33968
N85-34071
NSF PHY-82-07697 ..... N85-34094
NSF PHY-84-15294 ..... N85-34086
NSF PHY-84-25294 ..... N85-33933
NSG-7464 ..... N85-34105
NSG7-464 ..... N85-34022
N00014-75-C-0267 ..... N85-33711
N00014-80-C-0296 ..... N85-33733
N00014-82-K-0741 ..... N85-33753
N00014-83-C-0484 ..... N85-33509
N00014-83-K-0390 ..... N85-33627
N00014-84-C-0218 ..... N85-33295
N85-33709
N60921-84-C-0027 ..... N85-33574
PROJ. RR0-1108 ..... N85-33753
PROJ. RR0-2105 ..... N85-33282
RF PROJ. 764155/716288 ..... N85-33637
STPA-82-96-006 ..... N85-33510
SWEDCBR-840860-3 ..... N85-33487
W-31-109-ENG-38 ..... N85-33216
N85-33307
N85-33438
N85-33459
N85-33464
N85-33478
N85-33588
N85-33706
N85-33770
N85-33842
W-31-109-38 ..... N85-33801
W-7405-ENG-36 ..... N85-33202
N85-33219
N85-33220
N85-33232
N85-33257
N85-33269
N85-33292
N85-33300
N85-33309
N85-33434
N85-33440
N85-33443
N85-33446
N85-33454
N85-33481
N85-33549
N85-33592
N85-33605
N85-33707
N85-33719
N85-33722
N85-33742
N85-33743
N85-33757
N85-33758
N85-33760
N85-33770
N85-33773
N85-33775
N85-33780
N85-33781
N85-33782
N85-33791
N85-33793
N85-33794
N85-33795
N85-33804
N85-33830
N85-33832
N85-33899
W-7405-ENG-48 ..... N85-33233
N85-33301
N85-33310
N85-33312
N85-33442
N85-33461
N85-33483
N85-33484
N85-33501
N85-33603
N85-33606
N85-33613
N85-33723
N85-33724
N85-33739
N85-33768
N85-33769
N85-33797
N85-33806
N85-33824
N85-33831
N85-33834
N85-33896
W-7405-ENG-82 ..... N85-33214
W-7504-ENG-36 ..... N85-33254
199-99-00-00-72 ..... N85-33693
482-53-53-34 ..... N85-33539
505-31-21 ..... N85-33121
505-31-42 ..... N85-33435
505-33-43-09 ..... N85-33105
505-34-03-03 ..... N85-33125
505-34-11 ..... N85-33745
505-34-13-30 ..... N85-33708
505-34-13-32 ..... N85-33732
505-42-51 ..... N85-33111
505-43-11 ..... N85-33124
505-43-83-01 ..... N85-33107
505-45-11 ..... N85-33123
505-58-13-02 ..... N85-33106
506-51-11 ..... N85-33177
506-53-33-04 ..... N85-33436
506-53-33-11 ..... N85-33537
506-53-43-01 ..... N85-33181
506-53-53-07 ..... N85-33538
506-58-22 ..... N85-33293
506-64-13-01 ..... N85-33168
533-02-21 ..... N85-33122
533-02-61 ..... N85-33119
534-02-13-01 ..... N85-33116
776-33-41 ..... N85-33563

REPORT / ACCESSION NUMBER INDEX

Typical Report / Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The NASA accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

AD-A154877 ..... N85-33437 #
AD-A154901 ..... N85-33112 #
AD-A155291 ..... N85-33836 #
AD-A155354 ..... N85-33295 #
AD-A155355 ..... N85-33281 #
AD-A155356 ..... N85-33733 #
AD-A155357 ..... N85-33282 #
AD-A155358 ..... N85-33709 #
AD-A155360 ..... N85-33296 #
AD-A155379 ..... N85-33297 #
AD-A155383 ..... N85-33553 #
AD-A155392 ..... N85-33283 #
AD-A155399 ..... N85-33734 #
AD-A155404 ..... N85-33703 #
AD-A155405 ..... N85-33753 #
AD-A155412 ..... N85-33509 #
AD-A155418 ..... N85-33812 #
AD-A155426 ..... N85-33813 #
AD-A155715 ..... N85-33710 #
AD-A155717 ..... N85-33627 #
AD-A155718 ..... N85-33654 #
AD-A155720 ..... N85-33711 #
AD-A155722 ..... N85-33694 #
AD-A155723 ..... N85-33655 #
AD-A155730 ..... N85-33827 #
AD-A155732 ..... N85-33704 #
AD-A155733 ..... N85-33574 #
AD-A155736 ..... N85-33457 #

AD-D011728 ..... N85-33458 #
AD-D011730 ..... N85-33828 #
AD-D011731 ..... N85-33298 #
AD-D011733 ..... N85-33299 #
AD-D011734 ..... N85-33735 #
AD-D011735 ..... N85-33810 #
AD-D011736 ..... N85-33190 #
AD-D011737 ..... N85-33493 #
AD-D011738 ..... N85-33575 #
AD-D011739 ..... N85-33811 #

AD-E401352 ..... N85-33457 #

AD-F300613 ..... N85-33836 #

AERE-G-3368-PT-3 ..... N85-33833 #

AERONOMICA-ACTA-A-292-1984 ..... N85-33621
AERONOMICA-ACTA-A-294-1985 ..... N85-33622
AERONOMICA-ACTA-A-295-1985 ..... N85-33623

AFGL-TR-84-0318 ..... N85-33297 #

AFOSR-85-0468TR ..... N85-33296 #

AFWAL-TR-84-4156 ..... N85-33827 #
AFWAL-TR-85-1034 ..... N85-33710 #

AGARD-LS-141 ..... N85-33238 #

AIAA-PAPER-85-1848 ..... N85-33124* #

ALERT-85 ..... N85-33117 #

ANL-84-53 ..... N85-33706 #

ANL/CNSV-TM-150 ..... N85-33842 #

ANL/SPG-25 ..... N85-33588 #

AR-1 ..... N85-33248* #
AR-003-793 ..... N85-33167 #

ARL/AERO-TM-369 ..... N85-33112 #

ARO-20980.21-MA ..... N85-33704 #
ARO-21592.2-MA ..... N85-33711 #

ARPAD-TR-85001 ..... N85-33457 #

ASCOT-84-8 ..... N85-33613 #

ASR-1 ..... N85-33540* #

ATR-85(5836)-IND ..... N85-33593 #

BDM/W-83-225-TR ..... N85-33186* #

BDX-613-3244 ..... N85-33604 #
BDX-613-3265 ..... N85-33467 #

BM-B-677 ..... N85-33560 #

BMI/OCRD-20 ..... N85-33771 #

BMI/ONWI-568 ..... N85-33263 #

BNL-35461 ..... N85-33696 #
BNL-36325 ..... N85-33788 #
BNL-36406 ..... N85-33755 #
BNL-36429 ..... N85-33777 #
BNL-36430 ..... N85-33761 #
BNL-36434 ..... N85-33657 #
BNL-36453 ..... N85-33778 #
BNL-51864 ..... N85-33441 #
BNL-51867 ..... N85-33799 #

BR94469 ..... N85-33199
BR94715 ..... N85-33600
BR94717 ..... N85-33800
BR95202 ..... N85-33699
BR95295 ..... N85-33200
BR95441 ..... N85-33511
BR95442 ..... N85-33754
BR95443 ..... N85-33188
BR95444 ..... N85-33698
BR95524 ..... N85-33280

BU-111 ..... N85-33744 #

B8562882 ..... N85-33763 #

CAR-84-1 ..... N85-33542* #
CAR-85-1 ..... N85-33543* #
CAR-85-2 ..... N85-33747* #
CAR-85-3 ..... N85-33544* #

CCMS-85-05 ..... N85-33547* #

CD0H-DTP-R-84-20 ..... N85-33838 #

CFD/84/5 ..... N85-33447 #
CFD/84/21 ..... N85-33448 #
CFD/85/2 ..... N85-33449 #

CH-345/85 ..... N85-33615 #

CISE-2515 ..... N85-33617 #

COI-SR-15 ..... N85-33297 #

COMMITTEE-PRINT-99-F ..... N85-33601 #

COMS-85-06 ..... N85-33545* #
COMS-85-07 ..... N85-33546* #

CONF-840633-17 ..... N85-33628 #
CONF-840801-16 ..... N85-33502 #
CONF-840937-29 ..... N85-33308 #
CONF-840945-11 ..... N85-33775 #
CONF-850107-7 ..... N85-33630 #
CONF-850159-3 ..... N85-33789 #
CONF-850164-2 ..... N85-33784 #
CONF-850170-3 ..... N85-33556 #
CONF-850171-1 ..... N85-33790 #
CONF-850277-2 ..... N85-33899 #
CONF-850277-4 ..... N85-33898 #
CONF-850310-61 ..... N85-33824 #
CONF-850310-91 ..... N85-33776 #
CONF-850310-94 ..... N85-33820 #
CONF-850310-105 ..... N85-33805 #
CONF-850314-61 ..... N85-33796 #
CONF-850314-67 ..... N85-33803 #
CONF-850345-19 ..... N85-33484 #
CONF-850345-21 ..... N85-33219 #
CONF-850345-23 ..... N85-33218 #
CONF-850388-9 ..... N85-33590 #
CONF-850405-7 ..... N85-33639 #
CONF-850405-8 ..... N85-33235 #
CONF-850405-10-REV-1 ..... N85-33806 #
CONF-850421-7 ..... N85-33769 #
CONF-850425-3 ..... N85-33500 #
CONF-850504-10 ..... N85-33794 #
CONF-850504-14 ..... N85-33793 #
CONF-850504-15 ..... N85-33720 #
CONF-850504-16 ..... N85-33786 #
CONF-850504-17 ..... N85-33791 #
CONF-850504-19 ..... N85-33792 #
CONF-850504-22 ..... N85-33719 #
CONF-850504-28 ..... N85-33777 #
CONF-850504-29 ..... N85-33778 #
CONF-850504-46 ..... N85-33757 #
CONF-850504-82 ..... N85-33761 #
CONF-850504-86 ..... N85-33758 #
CONF-850504-120 ..... N85-33760 #
CONF-850506-3 ..... N85-33657 #
CONF-850506-4 ..... N85-33801 #
CONF-850506-6 ..... N85-33822 #
CONF-850507-13 ..... N85-33808 #
CONF-850513-ABSTS ..... N85-33192 #
CONF-850542-2 ..... N85-33216 #
CONF-850560-2 ..... N85-33755 #
CONF-850573-3 ..... N85-33831 #
CONF-850608-2 ..... N85-33470 #
CONF-850616-1 ..... N85-33275 #
CONF-850616-11 ..... N85-33759 #
CONF-850616-21 ..... N85-33313 #
CONF-850670-2 ..... N85-33549 #
CONF-850706-16 ..... N85-33220 #
CONF-850706-18 ..... N85-33269 #
CONF-850706-19 ..... N85-33270 #
CONF-850706-20 ..... N85-33271 #
CONF-850711-2 ..... N85-34111 #
CONF-850712-4 ..... N85-33446 #
CONF-850745-7 ..... N85-33443 #
CONF-850801-34 ..... N85-33587 #
CONF-8310362-SUMM ..... N85-33203 #
CONF-8404104-4 ..... N85-33268 #
CONF-8408229-1 ..... N85-33696 #
CONF-8409164-2 ..... N85-33779 #
CONF-8410172-9 ..... N85-33274 #
CONF-8410186-4 ..... N85-33481 #
CONF-8410246 ..... N85-33773 #
CONF-8410256 ..... N85-33770 #
CONF-8503100-6 ..... N85-33772 #
CONF-8503106 ..... N85-33562 #
CONF-8503115-2 ..... N85-33896 #
CONF-8503120-3 ..... N85-33795 #
CONF-8503129-2 ..... N85-33739 #
CONF-8503131-1 ..... N85-33307 #
CONF-8503138-1 ..... N85-33713 #
CONF-8504110-1 ..... N85-33782 #
CONF-8504110-14 ..... N85-33743 #
CONF-8504110-19 ..... N85-33742 #
CONF-8504117-2 ..... N85-33503 #
CONF-8504118-1 ..... N85-33232 #
CONF-8504121-2 ..... N85-33697 #
CONF-8504129-1 ..... N85-33736 #
CONF-8505103-4 ..... N85-33469 #

CONF-8505116-2 ..... N85-33115 #
CONF-8505130-4 ..... N85-33797 #
CONF-8505130-5 ..... N85-33834 #
CONF-8505131-2 ..... N85-33729 #
CONF-8505140-1 ..... N85-33721 #
CONF-8505142-1 ..... N85-33237 #
CONF-8505150-1 ..... N85-33722 #
CONF-8506116-1 ..... N85-33215 #

COO-1764-436 ..... N85-33798 #
COO-2383-01107 ..... N85-33740 #

CTH-MATH-1985-01 ..... N85-33748 #
CTH-MATH-1985-02 ..... N85-33749 #
CTH-MATH-1985-04 ..... N85-33750 #

DCEC-TN-5-85 ..... N85-33281 #

DE84-013023 ..... N85-33562 #
DE84-013024 ..... N85-33561 #
DE85-000512 ..... N85-33273 #
DE85-001995 ..... N85-33653 #
DE85-002924 ..... N85-33585 #
DE85-003016 ..... N85-33756 #
DE85-003296 ..... N85-33499 #
DE85-003713 ..... N85-33775 #
DE85-004538 ..... N85-33696 #
DE85-005029 ..... N85-33216 #
DE85-005816 ..... N85-33549 #
DE85-005913 ..... N85-33842 #
DE85-005986 ..... N85-33832 #
DE85-005993 ..... N85-33312 #
DE85-006081 ..... N85-33737 #
DE85-006765 ..... N85-33614 #
DE85-007005 ..... N85-33221 #
DE85-007493 ..... N85-33203 #
DE85-008168 ..... N85-33482 #
DE85-008419 ..... N85-34111 #
DE85-008677 ..... N85-33630 #
DE85-008776 ..... N85-33262 #
DE85-008780 ..... N85-33658 #
DE85-008783 ..... N85-33249* #
DE85-008794 ..... N85-33582 #
DE85-008797 ..... N85-33590 #
DE85-008875 ..... N85-33584 #
DE85-009142 ..... N85-33727 #
DE85-009415 ..... N85-33800 #
DE85-009596 ..... N85-33898 #
DE85-009625 ..... N85-33443 #
DE85-009850 ..... N85-33502 #
DE85-009851 ..... N85-33268 #
DE85-009861 ..... N85-33823 #
DE85-009868 ..... N85-33588 #
DE85-009926 ..... N85-33444 #
DE85-009966 ..... N85-33308 #
DE85-010002 ..... N85-33824 #
DE85-010021 ..... N85-33736 #
DE85-010026 ..... N85-33594 #
DE85-010071 ..... N85-33470 #
DE85-010174 ..... N85-33468 #
DE85-010289 ..... N85-33307 #
DE85-010403 ..... N85-33595 #
DE85-010410 ..... N85-33712 #
DE85-010418 ..... N85-33548 #
DE85-010429 ..... N85-33789 #
DE85-010465 ..... N85-33720 #
DE85-010475 ..... N85-33484 #
DE85-010553 ..... N85-33790 #
DE85-010572 ..... N85-33830 #
DE85-010589 ..... N85-33837 #
DE85-010604 ..... N85-33274 #
DE85-010659 ..... N85-33115 #
DE85-010672 ..... N85-33218 #
DE85-010688 ..... N85-33193 #
DE85-010695 ..... N85-33631 #
DE85-010698 ..... N85-33441 #
DE85-010707 ..... N85-33219 #
DE85-010711 ..... N85-33743 #
DE85-010713 ..... N85-33742 #
DE85-010714 ..... N85-33719 #
DE85-010727 ..... N85-33794 #
DE85-010747 ..... N85-33232 #
DE85-010750 ..... N85-33269 #
DE85-010751 ..... N85-33793 #
DE85-010760 ..... N85-33899 #
DE85-010766 ..... N85-33791 #
DE85-010771 ..... N85-33446 #
DE85-010781 ..... N85-33795 #
DE85-010785 ..... N85-33481 #
DE85-010794 ..... N85-33782 #
DE85-010795 ..... N85-33220 #
DE85-010810 ..... N85-33772 #
DE85-010827 ..... N85-33230 #
DE85-010839 ..... N85-33589 #
DE85-010943 ..... N85-33608 #
DE85-010958 ..... N85-33788 #

DE85-010967 ..... N85-33796 #
DE85-011006 ..... N85-33504 #
DE85-011027 ..... N85-33634 #
DE85-011145 ..... N85-33612 #
DE85-011147 ..... N85-33779 #
DE85-011151 ..... N85-33217 #
DE85-011171 ..... N85-33792 #
DE85-011175 ..... N85-33607 #
DE85-011197 ..... N85-33192 #
DE85-011204 ..... N85-33784 #
DE85-011208 ..... N85-33628 #
DE85-011209 ..... N85-33611 #
DE85-011213 ..... N85-33480 #
DE85-011224 ..... N85-33554 #
DE85-011250 ..... N85-33556 #
DE85-011294 ..... N85-33633 #
DE85-011306 ..... N85-33729 #
DE85-011308 ..... N85-33583 #
DE85-011357 ..... N85-33214 #
DE85-011361 ..... N85-33786 #
DE85-011378 ..... N85-33260 #
DE85-011385 ..... N85-33593 #
DE85-011402 ..... N85-33609 #
DE85-011413 ..... N85-33820 #
DE85-011423 ..... N85-33776 #
DE85-011430 ..... N85-33503 #
DE85-011437 ..... N85-33639 #
DE85-011453 ..... N85-33785 #
DE85-011454 ..... N85-33715 #
DE85-011456 ..... N85-33714 #
DE85-011463 ..... N85-33821 #
DE85-011482 ..... N85-33768 #
DE85-011486 ..... N85-33213 #
DE85-011492 ..... N85-33798 #
DE85-011505 ..... N85-33500 #
DE85-011507 ..... N85-33235 #
DE85-011531 ..... N85-33555 #
DE85-011533 ..... N85-33602 #
DE85-011546 ..... N85-33695 #
DE85-011562 ..... N85-33697 #
DE85-011570 ..... N85-33713 #
DE85-011584 ..... N85-33255 #
DE85-011585 ..... N85-33440 #
DE85-011588 ..... N85-33829 #
DE85-011590 ..... N85-33497 #
DE85-011593 ..... N85-33606 #
DE85-011594 ..... N85-33253 #
DE85-011596 ..... N85-33463 #
DE85-011597 ..... N85-33576 #
DE85-011598 ..... N85-33578 #
DE85-011601 ..... N85-33252 #
DE85-011602 ..... N85-33258 #
DE85-011605 ..... N85-33303 #
DE85-011608 ..... N85-33191 #
DE85-011609 ..... N85-33305 #
DE85-011610 ..... N85-33254 #
DE85-011614 ..... N85-33459 #
DE85-011615 ..... N85-33577 #
DE85-011616 ..... N85-33311 #
DE85-011618 ..... N85-33310 #
DE85-011619 ..... N85-33483 #
DE85-011621 ..... N85-33764 #
DE85-011622 ..... N85-33300 #
DE85-011624 ..... N85-33266 #
DE85-011625 ..... N85-33656 #
DE85-011626 ..... N85-33815 #
DE85-011628 ..... N85-33816 #
DE85-011629 ..... N85-33599 #
DE85-011630 ..... N85-33581 #
DE85-011632 ..... N85-33478 #
DE85-011633 ..... N85-33439 #
DE85-011634 ..... N85-33479 #
DE85-011635 ..... N85-33496 #
DE85-011636 ..... N85-33259 #
DE85-011640 ..... N85-33257 #
DE85-011641 ..... N85-33465 #
DE85-011642 ..... N85-33495 #
DE85-011643 ..... N85-33460 #
DE85-011645 ..... N85-33767 #
DE85-011646 ..... N85-33202 #
DE85-011647 ..... N85-33304 #
DE85-011650 ..... N85-33302 #
DE85-011651 ..... N85-33462 #
DE85-011654 ..... N85-33301 #
DE85-011655 ..... N85-33494 #
DE85-011656 ..... N85-33438 #
DE85-011658 ..... N85-33306 #
DE85-011659 ..... N85-33454 #
DE85-011660 ..... N85-33492 #
DE85-011662 ..... N85-33461 #
DE85-011663 ..... N85-33464 #
DE85-011664 ..... N85-33652 #
DE85-011665 ..... N85-33256 #
DE85-011666 ..... N85-33765 #
DE85-011670 ..... N85-33814 #
DE85-011674 ..... N85-33766 #

DE85-011684 ..... N85-33237 #
DE85-011698 ..... N85-33586 #
DE85-011704 ..... N85-33783 #
DE85-011708 ..... N85-33721 #
DE85-011712 ..... N85-33467 #
DE85-011718 ..... N85-33466 #
DE85-011719 ..... N85-33267 #
DE85-011726 ..... N85-33270 #
DE85-011740 ..... N85-33591 #
DE85-011783 ..... N85-33640 #
DE85-011794 ..... N85-33632 #
DE85-011802 ..... N85-33771 #
DE85-011812 ..... N85-33755 #
DE85-011823 ..... N85-33271 #
DE85-011824 ..... N85-33580 #
DE85-011835 ..... N85-33657 #
DE85-011836 ..... N85-33777 #
DE85-011838 ..... N85-33778 #
DE85-011844 ..... N85-33739 #
DE85-011850 ..... N85-33769 #
DE85-011851 ..... N85-33696 #
DE85-011853 ..... N85-33724 #
DE85-011858 ..... N85-33797 #
DE85-011859 ..... N85-33834 #
DE85-011868 ..... N85-33233 #
DE85-011869 ..... N85-33442 #
DE85-011872 ..... N85-33501 #
DE85-011886 ..... N85-33605 #
DE85-011888 ..... N85-33773 #
DE85-011891 ..... N85-33592 #
DE85-011893 ..... N85-33780 #
DE85-011896 ..... N85-33781 #
DE85-011905 ..... N85-33819 #
DE85-011928 ..... N85-33808 #
DE85-011943 ..... N85-33818 #
DE85-011946 ..... N85-33261 #
DE85-011962 ..... N85-33636 #
DE85-011965 ..... N85-33716 #
DE85-011968 ..... N85-33498 #
DE85-011988 ..... N85-33587 #
DE85-011998 ..... N85-33787
DE85-012003 ..... N85-33234 #
DE85-012004 ..... N85-33629 #
DE85-012017 ..... N85-33215 #
DE85-012020 ..... N85-33604 #
DE85-012027 ..... N85-33275 #
DE85-012060 ..... N85-33638 #
DE85-012063 ..... N85-33718 #
DE85-012068 ..... N85-33825 #
DE85-012079 ..... N85-33717 #
DE85-012081 ..... N85-33655 #
DE85-012108 ..... N85-33801 #
DE85-012113 ..... N85-33770 #
DE85-012309 ..... N85-33231 #
DE85-012322 ..... N85-33802 #
DE85-012339 ..... N85-33263 #
DE85-012400 ..... N85-33740 #
DE85-012429 ..... N85-33728 #
DE85-012455 ..... N85-33803 #
DE85-012467 ..... N85-33610 #
DE85-012514 ..... N85-33761 #
DE85-012537 ..... N85-33635 #
DE85-012568 ..... N85-33799 #
DE85-012585 ..... N85-33774 #
DE85-012586 ..... N85-33579 #
DE85-012599 ..... N85-33817 #
DE85-012667 ..... N85-33757 #
DE85-012672 ..... N85-33309 #
DE85-012674 ..... N85-33804 #
DE85-012687 ..... N85-33557 #
DE85-012693 ..... N85-33760 #
DE85-012718 ..... N85-33758 #
DE85-012730 ..... N85-33722 #
DE85-012790 ..... N85-33659 #
DE85-012797 ..... N85-33505 #
DE85-012819 ..... N85-33723 #
DE85-012835 ..... N85-33603 #
DE85-012857 ..... N85-33900 #
DE85-012861 ..... N85-33759 #
DE85-012894 ..... N85-33805 #
DE85-012898 ..... N85-33822 #
DE85-012960 ..... N85-33613 #
DE85-012968 ..... N85-33831 #
DE85-012969 ..... N85-33806 #
DE85-013029 ..... N85-33596 #
DE85-013032 ..... N85-33597 #
DE85-013079 ..... N85-33807 #
DE85-013119 ..... N85-33313 #
DE85-013137 ..... N85-33264 #
DE85-013179 ..... N85-33725 #
DE85-013245 ..... N85-33276 #
DE85-013256 ..... N85-33445 #
DE85-013260 ..... N85-33726 #
DE85-013278 ..... N85-33469 #
DE85-013316 ..... N85-33598 #
DE85-013326 ..... N85-33641 #

DE85-013367 ..... N85-33236 #
DE85-013589 ..... N85-33251* #

DMI-GEOPHYS-PAPERS-R-68 ..... N85-33751 #
DMI-GEOPHYS-PAPERS-R-69 ..... N85-33845 #

DOE/BP-395 ..... N85-33591 #
DOE/BP-15109/T1 ..... N85-33555 #

DOE/CE-0033/3 ..... N85-33581 #

DOE/CH-00016/T7 ..... N85-33659 #

DOE/CS-30602/T1 ..... N85-33499 #

DOE/ER-0214 ..... N85-33823 #
DOE/ER-00789/T108 ..... N85-33468 #
DOE/ER-04693/24 ..... N85-33580 #
DOE/ER-05126/183 ..... N85-33756 #
DOE/ER-10753/5 ..... N85-33900 #
DOE/ER-10921/T2 ..... N85-33554 #
DOE/ER-10977/T7 ..... N85-33737 #
DOE/ER-40105/T1 ..... N85-33798 #
DOE/ER-40124/T4 ..... N85-33274 #
DOE/ER-45056/T2 ..... N85-33482 #
DOE/ER-45110/T1 ..... N85-33261 #
DOE/ER-45142/1 ..... N85-33236 #
DOE/ER-45163/1 ..... N85-33213 #
DOE/ER-52105/T2 ..... N85-33817 #
DOE/ER-53179/T3 ..... N85-33800 #

DOE/ET-20152/1985 ..... N85-33640 #
DOE/ET-53047/22 ..... N85-33821 #
DOE/ET-53088/169 ..... N85-33818 #

DOE/EV-10610/4 ..... N85-33641 #

DOE/FE-60181/80 ..... N85-33215 #

DOE/ID-12082/84 ..... N85-33611 #
DOE/ID-12121/T2 ..... N85-33595 #

DOE/JPL-WO8746-02 ..... N85-33249* #

DOE/JPL-956312-85-11 ..... N85-33251* #
DOE/JPL-956334-85/01 ..... N85-33564* #
DOE/JPL-956685-02 ..... N85-33841* #
DOE/JPL-956786-85/4 ..... N85-33568* #
DOE/JPL-957031-85/3 ..... N85-33569* #
DOE/JPL-957126-85/01 ..... N85-33571* #

DOE/MC-20212/1808 ..... N85-33586 #
DOE/MC-20213/1820 ..... N85-33632 #

DOE/METC-85/0219 ..... N85-33653 #

DOE/NASA/0005-2 ..... N85-33563* #

DOE/NE-32123/T1 ..... N85-33807 #

DOE/NV-10270/2 ..... N85-33629 #
DOE/NV-10322/6 ..... N85-33631 #

DOE/PC-30229/1827 ..... N85-33193 #
DOE/PC-60807/6 ..... N85-33221 #
DOE/PC-61255/T1 ..... N85-33614 #
DOE/PC-61503/1-VOL-1 ..... N85-33217 #

DOE/PE-17056-T3 ..... N85-33276 #

DOE/PN-0014/T1 ..... N85-33602 #

DOE/RO-00498/T1 ..... N85-33837 #

DOE/RW-0004/1 ..... N85-33774 #

DOE/R8-01066/T2 ..... N85-33583 #

DOE/SF-12194/T1 ..... N85-33633 #
DOE/SF-12196/9 ..... N85-33636 #

DOE/WM-46642/T1 ..... N85-33634 #

DP-MS-84-129 ..... N85-33235 #
DP-MS-85-38 ..... N85-33500 #

DPST-85-232 ..... N85-33802 #

DRD-SE-2 ..... N85-33564* #
DRD-SE-2 ..... N85-33569* #

DRD-SE5 ..... N85-33568* #

DRIC-T-7411 ..... N85-33199
DRIC-T-7439 ..... N85-33809
DRIC-T-7460 ..... N85-33600

DRIC-T-7462 ..... N85-33511
DRIC-T-7467 ..... N85-33754
DRIC-T-7480 ..... N85-33200
DRIC-T-7481 ..... N85-33188
DRIC-T-7492 ..... N85-33698

DRL-188 ..... N85-33564* #
DRL-211 ..... N85-33568* #
DRL-223 ..... N85-33571* #

DSA-DI-S-4057 ..... N85-33703 #

D6-53012 ..... N85-33700 #
D483-10027-1 ..... N85-33172* #

E-2347 ..... N85-33435* #

EGG-WM-6835 ..... N85-33234 #

EGG-10282-1009 ..... N85-33638 #
EGG-10282-2054 ..... N85-33237 #

ENST-84E017 ..... N85-33284 #
ENST-84E018 ..... N85-33705 #
ENST-85D001 ..... N85-33285 #

EPA-600/3-85-025 ..... N85-33619 #
EPA-600/3-85-026 ..... N85-33618 #
EPA-600/3-85-027 ..... N85-33648 #
EPA-600/3-85-028 ..... N85-33620 #

EPA/AA/SDSB/85-4 ..... N85-33477 #

EPRI-EA-4017 ..... N85-33695 #

EPRI-EM-4036-VOL-1 ..... N85-33589 #

ESA-CR(P)-2014-PT-3 ..... N85-33833 #
ESA-CR(P)-2016 ..... N85-33277 #

ESD-TR-84-203 ..... N85-33283 #

ETL-0388 ..... N85-33703 #

FAA-AC-43-16 ..... N85-33117 #

FAA/PM-85-12 ..... N85-33113 #
FAA/PM-85-19 ..... N85-33700 #

FAI-85/15 ..... N85-33279 #

FNAL/C-85/45 ..... N85-33790 #

FOA-C-20569-D9 ..... N85-33487 #
FOA-C-30385-E4 ..... N85-33288 #
FOA-C-30387-E1 ..... N85-33558 #

FOA-C5-85-0002-H1 ..... N85-33278 #

FOA-E-40019 ..... N85-33616 #

FR-60038 ..... N85-33564* #

FUB-14-1984 ..... N85-33746 #
FUB-17-1984 ..... N85-33730 #
FUB-50-1983 ..... N85-33286 #
FUB-52-1983 ..... N85-33287 #

FZM-7218 ..... N85-33710 #

GAT-T-3334 ..... N85-33505 #

GJ/TMC-22 ..... N85-33785 #

GPO-43-653 ..... N85-33601 #

GRI-82/0041 ..... N85-33228 #
GRI-84/0148 ..... N85-33476 #
GRI-85/0027 ..... N85-33227 #
GRI-85/0072 ..... N85-33279 #
GRI-85/0094 ..... N85-33559 #

H-1288 ..... N85-33124* #
H-1291 ..... N85-33119* #
H-1292 ..... N85-33121* #
H-1294 ..... N85-33122* #
H-1298 ..... N85-33123* #
H-8407-07 ..... N85-33456* #

IFSI-85-2 ..... N85-33844 #

IFSR-169 ..... N85-33818 #

IMMR84-096 ..... N85-33453 #

IR-3 ..... N85-33491* #

IR-50 ..... N85-33547* #
IR-51 ..... N85-33545* #
IR-52 ..... N85-33546* #

IS-4870 ..... N85-33214 #

ISBN-87-7478-222-3 ..... N85-33751 #
ISBN-87-7478-223-1 ..... N85-33845 #
ISBN-92-63-10642-8 ..... N85-33643 #
ISBN-92-63-10643-6 ..... N85-33644* #
ISBN-92-835-1500-5 ..... N85-33238 #
ISBN-951-38-2235-4 ..... N85-33551 #
ISBN-951-38-2251-6 ..... N85-33507 #

ISL-CO-207/84 ..... N85-33178 #
ISL-CO-209/84 ..... N85-33741 #
ISL-CO-212/84 ..... N85-33450 #
ISL-CO-213/84 ..... N85-33472 #
ISL-CO-214/84 ..... N85-33473 #
ISL-CO-215/84 ..... N85-33451 #
ISL-CO-216/84 ..... N85-33474 #
ISL-CO-217/84 ..... N85-33452 #
ISL-CO-218/84 ..... N85-33488 #
ISL-CO-220/84 ..... N85-33224 #
ISL-CO-221/84 ..... N85-33225 #
ISL-CO-229/84 ..... N85-33272 #

ISL-R-105/84-PT-2C ..... N85-33486 #
ISL-R-108/84 ..... N85-33223 #
ISL-R-109/84 ..... N85-33226 #
ISL-R-112/84 ..... N85-33731 #

ISS-T-84/6 ..... N85-33471 #

ISSN-0143-7143 ..... N85-33752
ISSN-0143-7305 ..... N85-33290
ISSN-0143-7305 ..... N85-33291
ISSN-0143-7313 ..... N85-33195
ISSN-0169-1651 ..... N85-33645 #
ISSN-0178-0719 ..... N85-34112 #
ISSN-0347-2809 ..... N85-33748 #
ISSN-0347-2809 ..... N85-33749 #
ISSN-0347-2809 ..... N85-33750 #
ISSN-0347-3694 ..... N85-33487 #
ISSN-0347-3708 ..... N85-33288 #
ISSN-0347-3708 ..... N85-33558 #
ISSN-0347-7665 ..... N85-33278 #
ISSN-0358-5077 ..... N85-33507 #
ISSN-0358-5077 ..... N85-33551 #
ISSN-0390-6485 ..... N85-33471 #
ISSN-0751-1345 ..... N85-33285 #
ISSN-0751-1351 ..... N85-33705 #
ISSN-0751-1353 ..... N85-33284 #

IU-UILU-ENG-85-1709 ..... N85-33740 #

IU-UIUCDCS-R-85-1205 ..... N85-33740 #

JPL-9950-885 ..... N85-33570* #
JPL-9950-1003 ..... N85-33841* #
JPL-9950-1139 ..... N85-33564* #
JPL-9950-1142 ..... N85-33651* #
JPL-9950-1144 ..... N85-33180* #
JPL-9950-1150 ..... N85-33571* #
JPL-9950-1156 ..... N85-33249* #
JPL-9950-1162 ..... N85-33176* #
JPL-9950-1167 ..... N85-33179* #
JPL-9950-1170 ..... N85-33650* #

JPRS-UBB-85-018 ..... N85-33660 #

JPRS-UEE-84-003 ..... N85-33381 #
JPRS-UEE-84-015 ..... N85-33314 #

JPRS-USB-85-004 ..... N85-33667 #

JPRS-USP-84-006 ..... N85-33128 #

K-TRANS-299 ..... N85-33264 #

KNMI-WR-85-2 ..... N85-33645 #

L-10094-M ..... N85-33707 #
L-15806 ..... N85-33168* #
L-15921 ..... N85-33116* #
L-15938 ..... N85-33538* #
L-15951 ..... N85-33107* #
L-15957 ..... N85-33106* #
L-15967 ..... N85-33537* #

LA-UR-84-3506 ..... N85-33775 #
LA-UR-85-158 ..... N85-33549 #
LA-UR-85-1049 ..... N85-33443 #
LA-UR-85-1073 ..... N85-33898 #
LA-UR-85-1149 ..... N85-33446 #
LA-UR-85-1172 ..... N85-33791 #

LA-UR-85-1176 ..... N85-33220 #
LA-UR-85-1186 ..... N85-33782 #
LA-UR-85-1208 ..... N85-33481 #
LA-UR-85-1253 ..... N85-33719 #
LA-UR-85-1255 ..... N85-337..2 #
LA-UR-85-1261 ..... N85-33743 #
LA-UR-85-1278 ..... N85-33219 #
LA-UR-85-1305 ..... N85-33899 #
LA-UR-85-1375 ..... N85-33795 #
LA-UR-85-1380 ..... N85-33793 #
LA-UR-85-1390 ..... N85-33269 #
LA-UR-85-1398 ..... N85-33232 #
LA-UR-85-1490 ..... N85-33794 #
LA-UR-85-1526 ..... N85-33760 #
LA-UR-85-1602 ..... N85-33804 #
LA-UR-85-1605 ..... N85-33309 #
LA-UR-85-1610 ..... N85-33757 #
LA-UR-85-1682 ..... N85-33758 #
LA-UR-85-1728 ..... N85-33722 #

LA-9487-MS-VOL-3 ..... N85-33781 #
LA-9703 ..... N85-33434 #
LA-10028-MS ..... N85-33166 #
LA-10072-MS ..... N85-33292 #
LA-10320-MS ..... N85-33830 #
LA-10323-MS ..... N85-33592 #
LA-10370-C ..... N85-33773 #
LA-10376-MS ..... N85-33780 #
LA-10421-ENV ..... N85-33605 #

LBL-17696 ..... N85-33628 #
LBL-18520 ..... N85-33598 #
LBL-18654 ..... N85-33308 #
LBL-18849 ..... N85-33630 #
LBL-19033 ..... N85-33784 #
LBL-19365 ..... N85-33587 #
LBL-19435 ..... N85-33779 #

LC-84-600195 ..... N85-33560 #
LC-85-1794 ..... N85-33126* #

LIDS-P-1456 ..... N85-33704 #

LPI-CONTRIB-569 ..... N85-33849* #

M-495 ..... N85-33169* #

MCP-JPL-PAPER-12-26-37 ..... N85-33899 #

MHSMP-85-04 ..... N85-33267 #

MLM-3248 ..... N85-33786 #

MPE-191 ..... N85-34112 #

MRC-TSR-2812 ..... N85-33437 #

MRL-R-900 ..... N85-33167 #

MTR-85W28 ..... N85-33113 #
MTR-9492 ..... N85-33283 #

NAS 1.15:58268 ..... N85-33693* #
NAS 1.15:77884 ..... N85-33108* #
NAS 1.15:77892 ..... N85-33110* #
NAS 1.15:85917 ..... N85-33118* #
NAS 1.15:86218 ..... N85-33552* #
NAS 1.15:86382 ..... N85-33538* #
NAS 1.15:86385 ..... N85-33168* #
NAS 1.15:86386 ..... N85-33539* #
NAS 1.15:86516 ..... N85-33567* #
NAS 1.15:86728 ..... N85-33124* #
NAS 1.15:86731 ..... N85-33119* #
NAS 1.15:86732 ..... N85-33121* #
NAS 1.15:86736 ..... N85-33122* #
NAS 1.15:86738 ..... N85-33123* #
NAS 1.15:86769 ..... N85-33177* #
NAS 1.15:86900 ..... N85-33435* #
NAS 1.15:87496 ..... N85-33173* #
NAS 1.15:87497 ..... N85-33174* #
NAS 1.15:87573 ..... N85-33181* #
NAS 1.15:87581 ..... N85-33436* #
NAS 1.21:400 ..... N85-33126* #
NAS 1.21:7037(189) N85-33104*
NAS 1.21:7039(27)-SECTION-1 ..... N85-33840*
NAS 1.26:3899 ..... N85-33105* #
NAS 1.26:3920 ..... N85-33732* #
NAS 1.26:172609 ..... N85-33708 #
NAS 1.26:174909 ..... N85-33491* #
NAS 1.26:174921 ..... N85-33563* #
NAS 1.26:174956 ..... N85-33541* #
NAS 1.26:174957 ..... N85-33540* #
NAS 1.26:174969 ..... N85-33293* #
NAS 1.26:175295 ..... N85-33702* #
NAS 1.26:175302 ..... N85-33184* #
NAS 1.26:175319 ..... N85-33738* #
NAS 1.26:176054 ..... N85-33569* #
NAS 1.26:176057 ..... N85-33846* #
NAS 1.26:176078 ..... N85-33847* #
NAS 1.26:176090 ..... N85-33897* #
NAS 1.26:176092 ..... N85-33175* #
NAS 1.26:176093 ..... N85-33849* #
NAS 1.26:176095 ..... N85-33172* #
NAS 1.26:176099 ..... N85-33170* #
NAS 1.26:176100 ..... N85-33171* #
NAS 1.26:176101 ..... N85-33568* #
NAS 1.26:176102 ..... N85-33201* #
NAS 1.26:176103 ..... N85-33294* #
NAS 1.26:176104 ..... N85-33566* #
NAS 1.26:176105 ..... N85-33650* #
NAS 1.26:176107 ..... N85-33625* #
NAS 1.26:176108 ..... N85-33186* #
NAS 1.26:176109 ..... N85-33571* #
NAS 1.26:176111 ..... N85-33180* #
NAS 1.26:176112 ..... N85-33249* #
NAS 1.26:176113 ..... N85-33250* #
NAS 1.26:176114 ..... N85-33841* #
NAS 1.26:176116 ..... N85-33570* #
NAS 1.26:176120 ..... N85-33747* #
NAS 1.26:176121 ..... N85-33185* #
NAS 1.26:176122 ..... N85-33637* #
NAS 1.26:176123 ..... N85-33651* #
NAS 1.26:176124 ..... N85-33565* #
NAS 1.26:176125 ..... N85-33251* #
NAS 1.26:176128 ..... N85-33189* #
NAS 1.26:176129 ..... N85-33179* #
NAS 1.26:176130 ..... N85-33248* #
NAS 1.26:176133 ..... N85-33176* #
NAS 1.26:176134 ..... N85-33564* #
NAS 1.26:176137 ..... N85-33848* #
NAS 1.26:176139 ..... N85-33544* #
NAS 1.26:176140 ..... N85-33543* #
NAS 1.26:176144 ..... N85-33542* #
NAS 1.26:176146 ..... N85-33547* #
NAS 1.26:176147 ..... N85-33545* #
NAS 1.26:176148 ..... N85-33546* #
NAS 1.26:176150 ..... N85-33624* #
NAS 1.26:176154 ..... N85-33456* #
NAS 1.26:177344 ..... N85-33111* #
NAS 1.26:177938 ..... N85-33109* #
NAS 1.26:177942 ..... N85-33125* #
NAS 1.55:2371 ..... N85-33512* #
NAS 1.55:2376 ..... N85-33901* #
NAS 1.55:2376-VOL-1 ..... N85-33902* #
NAS 1.55:2376-VOL-2 ..... N85-34006* #
NAS 1.60:2458 ..... N85-33106* #
NAS 1.60:2467 ..... N85-33107* #
NAS 1.60:2480 ..... N85-33537* #
NAS 1.60:2487 ..... N85-33745* #
NAS 1.60:2507 ..... N85-33169* #
NAS 1.61:1135 ..... N85-33116* #

NAS/JPL-9950-1158 ..... N85-33251* #

NASA-CASE-ARC-11243-2 ..... N85-33187*

NASA-CASE-LEW-13506-1 ..... N85-33490*
NASA-CASE-LEW-13914-1 ..... N85-33489*
NASA-CASE-LEW-14039-1 ..... N85-33433*

NASA-CASE-MFS-25319-1 ..... N85-33701*

NASA-CASE-MSC-20036-1 ..... N85-33826*

NASA-CP-2371 ..... N85-33512* #
NASA-CP-2376 ..... N85-33901* #
NASA-CP-2376-VOL-1 ..... N85-33902* #
NASA-CP-2376-VOL-2 ..... N85-34006* #

NASA-CR-3899 ..... N85-33105* #
NASA-CR-3920 ..... N85-33732* #
NASA-CR-172609 ..... N85-33708 #
NASA-CR-174909 ..... N85-33491* #
NASA-CR-174921 ..... N85-33563* #
NASA-CR-174956 ..... N85-33541* #
NASA-CR-174957 ..... N85-33540* #
NASA-CR-174969 ..... N85-33293* #
NASA-CR-175295 ..... N85-33702* #
NASA-CR-175302 ..... N85-33184* #
NASA-CR-175319 ..... N85-33738* #
NASA-CR-176054 ..... N85-33569* #
NASA-CR-176057 ..... N85-33846* #
NASA-CR-176078 ..... N85-33847* #
NASA-CR-176090 ..... N85-33897* #
NASA-CR-176092 ..... N85-33175* #
NASA-CR-176093 ..... N85-33849* #
NASA-CR-176095 ..... N85-33172* #
NASA-CR-176099 ..... N85-33170* #
NASA-CR-176100 ..... N85-33171* #
NASA-CR-176101 ..... N85-33568* #
NASA-CR-176102 ..... N85-33201* #
NASA-CR-176103 ..... N85-33294* #
NASA-CR-176104 ..... N85-33566* #
NASA-CR-176105 ..... N85-33650* #
NASA-CR-176107 ..... N85-33625* #
NASA-CR-176108 ..... N85-33186* #
NASA-CR-176109 ..... N85-33571* #
NASA-CR-176111 ..... N85-33180* #
NASA-CR-176112 ..... N85-33249* #
NASA-CR-176113 ..... N85-33250* #
NASA-CR-176114 ..... N85-33841* #
NASA-CR-176116 ..... N85-33570* #
NASA-CR-176120 ..... N85-33747* #
NASA-CR-176121 ..... N85-33185* #
NASA-CR-176122 ..... N85-33637* #
NASA-CR-176123 ..... N85-33651* #
NASA-CR-176124 ..... N85-33565* #
NASA-CR-176125 ..... N85-33251* #
NASA-CR-176128 ..... N85-33189* #
NASA-CR-176129 ..... N85-33179* #
NASA-CR-176130 ..... N85-33248* #
NASA-CR-176133 ..... N85-33176* #
NASA-CR-176134 ..... N85-33564* #
NASA-CR-176137 ..... N85-33848* #
NASA-CR-176139 ..... N85-33544* #
NASA-CR-176140 ..... N85-33543* #
NASA-CR-176144 ..... N85-33542* #
NASA-CR-176146 ..... N85-33547* #
NASA-CR-176147 ..... N85-33545* #
NASA-CR-176148 ..... N85-33546* #
NASA-CR-176150 ..... N85-33624* #
NASA-CR-176154 ..... N85-33456* #
NASA-CR-177344 ..... N85-33111* #
NASA-CR-177938 ..... N85-33109* #
NASA-CR-177942 ..... N85-33125* #

NASA-RF-1135 ..... N85-33116* #

NASA-SP-480 ..... N85-33126* #
NASA-SP-7037(189) N85-33104*
NASA-SP-7039(27)-SECTION-1 ..... N85-33840*

NASA-TM-58268 ..... N85-33693* #
NASA-TM-77884 ..... N85-33108* #
NASA-TM-77892 ..... N85-33110* #
NASA-TM-85917 ..... N85-33118* #
NASA-TM-86218 ..... N85-33552* #
NASA-TM-86382 ..... N85-33538* #
NASA-TM-86385 ..... N85-33168* #
NASA-TM-86386 ..... N85-33539* #
NASA-TM-86516 ..... N85-33567* #
NASA-TM-86728 ..... N85-33124* #
NASA-TM-86731 ..... N85-33119* #
NASA-TM-86732 ..... N85-33121* #
NASA-TM-86736 ..... N85-33122* #
NASA-TM-86738 ..... N85-33123* #
NASA-TM-86769 ..... N85-33177* #
NASA-TM-86900 ..... N85-33435* #
NASA-TM-87496 ..... N85-33173* #
NASA-TM-87497 ..... N85-33174* #
NASA-TM-87573 ..... N85-33181* #
NASA-TM-87581 ..... N85-33436* #

NASA-TP-2458 ..... N85-33106* #
NASA-TP-2467 ..... N85-33107* #
NASA-TP-2480 ..... N85-33537* #
NASA-TP-2487 ..... N85-33745* #
NASA-TP-2507 ..... N85-33169* #

NBSIR-84-2922 ..... N85-33839 #

NCAR-AR-84 ..... N85-33835 #

NCAR/CQ-8+1984-ASP ..... N85-33649 #

NIKHEF-H/85-1 ..... N85-33763 #

NOAA-TM-ERL-WPL-120 ..... N85-33647 #

NOAA-TR-NESDIS-22 ..... N85-33182 #
NOAA-TR-NESDIS-23 ..... N85-33626 #

NPL-AC-103 ..... N85-33752

NPL-DES-81 ..... N85-33291
NPL-DES-82 ..... N85-33290

NPL-DMA(A)-84 ..... N85-33455
NPL-DMA(A)-96 ..... N85-33229
NPL-DMA(A)-98 ..... N85-33195

NRL-MR-5597 ..... N85-33812 #
NRL-MR-5594 ..... N85-33813 #

NRL-8895 ..... N85-33282 #

NSWC-TR-84-302 ..... N85-33574 #

NTSB-AAR-82-15 ..... N85-33114 #
NTSB-AAR-85-06 ..... N85-33114 #

NYU/DAS-85-137 ..... N85-33641 #

OEFZS-4312 ..... N85-33762 #
OEFZS-4313 ..... N85-33550 #
OEFZS-4317 ..... N85-33615 #

OG-1.1-1 ..... N85-33903* #
OG-1.1-2 ..... N85-33904* #
OG-1.1-3 ..... N85-33905* #
OG-1.1-4 ..... N85-33906* #
OG-1.1-5 ..... N85-33907* #
OG-1.1-7 ..... N85-33908* #
OG-1.1-8 ..... N85-33909* #
OG-1.1-9 ..... N85-33910* #
OG-1.1-10 ..... N85-33911* #
OG-1.2-1 ..... N85-33912* #
OG-1.2-3 ..... N85-33913* #
OG-1.2-4 ..... N85-33914* #
OG-1.2-5 ..... N85-33915* #
OG-1.2-6 ..... N85-33916* #
OG-1.2-7 ..... N85-33917* #
OG-1.2-10 ..... N85-33918* #
OG-2.1-1 ..... N85-33919* #
OG-2.1-3 ..... N85-33920* #
OG-2.1-4 ..... N85-33921* #
OG-2.1-5 ..... N85-33922* #
OG-2.1-6 ..... N85-33923* #
OG-2.1-7 ..... N85-33924* #
OG-2.1-8 ..... N85-33925* #
OG-2.1-10 ..... N85-33926* #
OG-2.1-11 ..... N85-33927* #
OG-2.1-12 ..... N85-33928* #
OG-2.2-2 ..... N85-33929* #
OG-2.2-3 ..... N85-33930* #
OG-2.2-5 ..... N85-33931* #
OG-2.2-6 ..... N85-33932* #
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OG-2.2-8 ..... N85-33934* #
OG-2.2-9 ..... N85-33935* #
OG-2.2-10 ..... N85-33936* #
OG-2.2-12 ..... N85-33937* #
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OG-2.4-2 ..... N85-33949* #
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OG-2.4-4 ..... N85-33951* #
OG-2.4-5 ..... N85-33952* #
OG-2.4-6 ..... N85-33953* #
OG-2.4-9 ..... N85-33954* #
OG-2.4-11 ..... N85-33955* #
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OG-2.6-13 ..... N85-33974* #
OG-2.6-14 ..... N85-33975* #
OG-2.7-1 ..... N85-33976* #
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OG-2.7-14 ..... N85-33987* #
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OG-2.8-8 ..... N85-33981* #
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OG-3.1-11 ..... N85-33999* #
OG-3.1-12 ..... N85-34000* #
OG-3.2-1 ..... N85-34001* #
OG-3.2-3 ..... N85-34002* #
OG-3.2-5 ..... N85-34003* #
OG-3.2-8 ..... N85-34004* #
OG-4.1-1 ..... N85-34007* #
OG-4.1-2 ..... N85-34008* #
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OG-4.1-4 ..... N85-34010* #
OG-4.1-5 ..... N85-34011* #
OG-4.1-6 ..... N85-34012* #
OG-4.1-7 ..... N85-34013* #
OG-4.1-8 ..... N85-34014* #
OG-4.1-9 ..... N85-34015* #
OG-4.1-10 ..... N85-34016* #
OG-4.1-11 ..... N85-34017* #
OG-4.1-12 ..... N85-34018* #
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OG-5.4-12 ..... N85-34089* #
OG-5.4-13 ..... N85-34090* #
OG-5.4-15 ..... N85-34091* #
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OG-6.1-7 ..... N85-34098* #
OG-6.1-8 ..... N85-34099* #
OG-6.1-9 ..... N85-34100* #
OG-6.1-11 ..... N85-34101* #
OG-6.2-1 ..... N85-34102* #
OG-6.2-3 ..... N85-34103* #
OG-6.2-5 ..... N85-34104* #
OG-6.2-6 ..... N85-34105* #
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OG-6.2-9 ..... N85-34108* #
OG-6.2-10 ..... N85-34109* #
OG-6.2-11 ..... N85-34110* #

ONR-85-1 ..... N85-33753 #

ORNL-TM-9645 ..... N85-33655 #

ORNL-TOX-82-1 ..... N85-33655 #

ORNL-6150 ..... N85-33717 #
ORNL-6174 ..... N85-33718 #

ORNL/TM-9399 ..... N85-33825 #
ORNL/TM-9517 ..... N85-33819 #

ORO-5126-183 ..... N85-33756 #

PATENT-APPL-SN-628700 ..... N85-33478 #

PATENT-APPLICATION-SN-666585 ..... N85-33815 #

PB85-177335 ..... N85-33838 #
PB85-181477 ..... N85-33289 #
PB85-181485 ..... N85-33475 #
PB85-183093 ..... N85-33477 #
PB85-183804 ..... N85-33646 #
PB85-184331 ..... N85-33560 #
PB85-185486 ..... N85-33647 #
PB85-185585 ..... N85-33194 #
PB85-185718 ..... N85-33265 #
PB85-185817 ..... N85-33648 #
PB85-185841 ..... N85-33620 #
PB85-185858 ..... N85-33618 #
PB85-186492 ..... N85-33619 #
PB85-187961 ..... N85-33453 #
PB85-188266 ..... N85-33649 #
PB85-191237 ..... N85-33835 #
PB85-191948 ..... N85-33839 #
PB85-192250 ..... N85-33228 #
PB85-192276 ..... N85-33559 #
PB85-198430 ..... N85-33476 #
PB85-198471 ..... N85-33227 #
PB85-198489 ..... N85-33279 #
PB85-910406 ..... N85-33114 #

PNL-SA-12622 ..... N85-33796 #
PNL-SA-12625 ..... N85-33803 #
PNL-SA-12901 ..... N85-33469 #

PNL-4621-ADD-1 ..... N85-33609 #
PNL-5376 ..... N85-33230 #
PNL-5437 ..... N85-33466 #
PNL-5446 ..... N85-33610 #
PNL-5460-VOL-1 ..... N85-33608 #
PNL-5463 ..... N85-33597 #
PNL-5483 ..... N85-33596 #
PNL-5501 ..... N85-33635 #

PR-CPPS-31 ..... N85-33189* #

PR-9 ..... N85-33184* #

PV-43-954/F ..... N85-33510 #

REC-ERC-84-8 ..... N85-33194 #
REC-ERC-84-11 ..... N85-33265 #

REPT-47 ..... N85-33499 #
REPT-85-0817 ..... N85-33559 #
REPT-85B0413 ..... N85-33552* #
REPT-85B0504 ..... N85-33738* #
REPT-7205-8 ..... N85-33125* #
REPT-85022 ..... N85-33745* #
REPT-85136 ..... N85-33118* #
REPT-85181 ..... N85-33512* #
REPT-85277 ..... N85-33177* #
REPT-956541-EXT-2 ..... N85-33179* #
REPT-956541-EXT-2 ..... N85-33180* #

RFP-3785 ..... N85-33727 #

RHO-BW-SA-364P ..... N85-33556 #

RR-R84-4 ..... N85-33196 #

RR-270 ..... N85-33506 #

RRC-85-R-999 ..... N85-33185* #

RS-247/85 ..... N85-33762 #
RS-248/85 ..... N85-33550 #

RSRE-MEMO-3695 ..... N85-33699

RSRE-85005 ..... N85-33260

RV10/84424 ..... N85-33198 #

R85-900026-F ..... N85-33109* #

S-548 ..... N85-33693* #

SAND-83-2583/2-ADD ..... N85-33712 #
SAND-84-1654 ..... N85-33725 #
SAND-84-1860C ..... N85-33271 #
SAND-84-2061 ..... N85-33218 #
SAND-84-2398C ..... N85-33275 #
SAND-84-2523C ..... N85-33313 #
SAND-84-2559C ..... N85-33759 #
SAND-84-2618 ..... N85-33714 #
SAND-84-7005 ..... N85-33584 #
SAND-84-8224 ..... N85-33502 #
SAND-84-8252 ..... N85-33203 #
SAND-85-0111 ..... N85-33445 #
SAND-85-0138C ..... N85-33470 #
SAND-85-0276 ..... N85-33715 #
SAND-85-0303 ..... N85-33548 #
SAND-85-0550 ..... N85-33607 #
SAND-85-0551 ..... N85-33612 #
SAND-85-0632C ..... N85-34111 #
SAND-85-0761C ..... N85-33270 #
SAND-85-0780C ..... N85-33721 #
SAND-85-0856 ..... N85-33726 #
SAND-85-0925C ..... N85-33736 #
SAND-85-0996C ..... N85-33115 #
SAND-85-1094C ..... N85-33260 #
SAND-85-7166 ..... N85-33557 #
SAND-85-8177 ..... N85-33579 #
SAND-85-8212 ..... N85-33594 #
SAND-85-8218 ..... N85-33498 #
SAND-85-8219 ..... N85-33716 #

SASR-1 ..... N85-33624* #
SASR-3 ..... N85-33847* #

SERI/CP-211-2682 ..... N85-33582 #

SERI/PR-212-2634 ..... N85-33249* #

SERI/SP-271-2452 ..... N85-33585 #

SERI/STR-211-2575 ..... N85-33262 #
SERI/STR-231-2649 ..... N85-33658 #

SERI/TP-252-2683 ..... N85-33590 #
SERI/TP-255-2454 ..... N85-33273 #

SERI/TR-253-2185 ..... N85-33562 #
SERI/TR-253-2187 ..... N85-33561 #

SNIAS-851-430-102 ..... N85-33197 #
SNIAS-851-440-106 ..... N85-33183 #
SNIAS-851-502-101 ..... N85-33120 #
SNIAS-1029ACA/LL/V ..... N85-33277 #

SSPS-TR-7/84 ..... N85-33468 #

STN-4 ..... N85-33485 #

SU-E724-1 ..... N85-33627 #

SU-SGP-TR-83 ..... N85-33444 #

SU-SLAC-CN-292 ..... N85-33783 #

SU-SLAC-PUB-3618 ..... N85-33720 #
SU-SLAC-PUB-3653 ..... N85-33792 #

SU-SLAC/AP-41 ..... N85-33480 #

SU-SOL-85-2 ..... N85-33711 #

TP/D-85-8 ..... N85-33295 #
TP/D-85-9 ..... N85-33709 #

TPR-8 ..... N85-33807 #

TR-1 ..... N85-33800 #

T47130 ..... N85-33111* #

UC/MET-22278-01 ..... N85-33231 #

UCID-20250 ..... N85-33233 #
UCID-20408 ..... N85-33501 #
UCID-20413-VOL-1 ..... N85-33724 #
UCID-20418 ..... N85-33442 #
UCID-20422 ..... N85-33723 #

UCRI-92375 ..... N85-33834 #

UCRL-15659 ..... N85-33831 #
UCRL-15662 ..... N85-33613 #
UCRL-50027-84 ..... N85-33606 #
UCRL-50400-VOL-26 ..... N85-33768 #
UCRL-53641 ..... N85-33603 #
UCRL-91499-REV-1 ..... N85-33806 #
UCRL-91646 ..... N85-33824 #
UCRL-91724 ..... N85-33769 #
UCRL-92262 ..... N85-33484 #
UCRL-92397 ..... N85-33797 #
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